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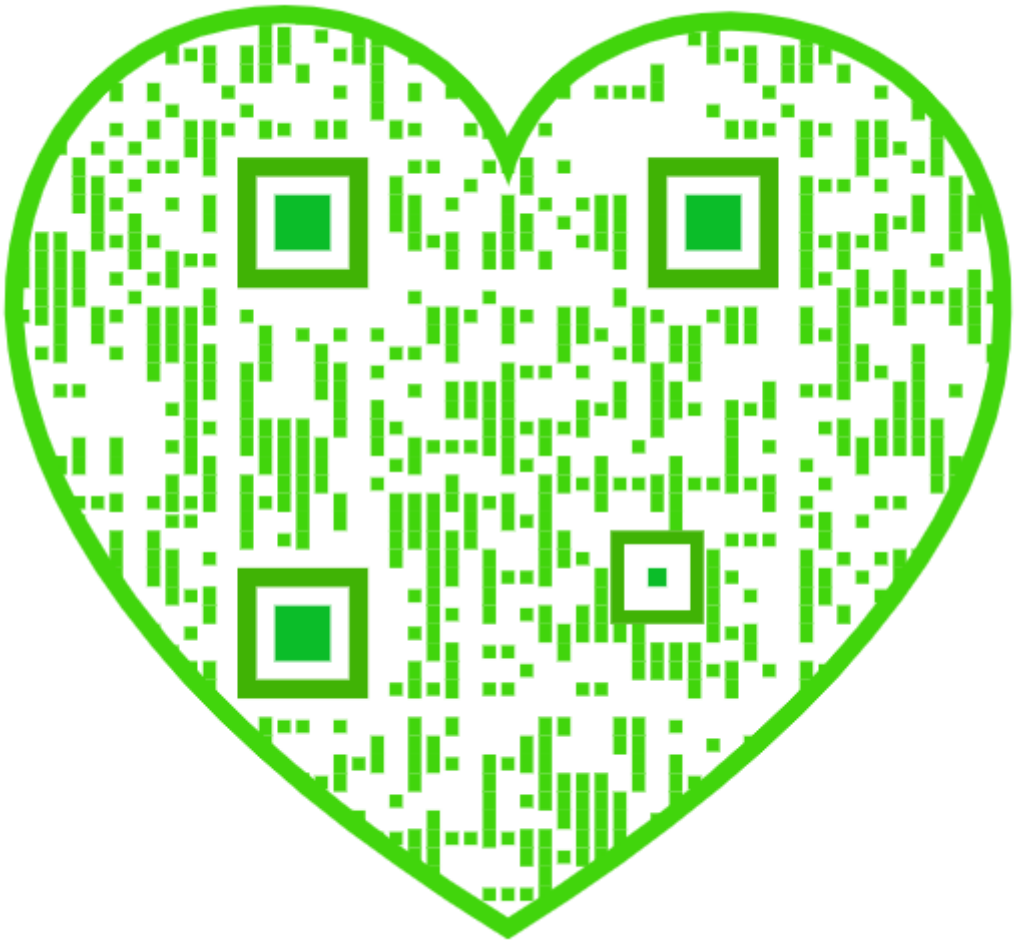

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GUIDE TO FORESTRY

BOOK ONE

BY

JOSEPH S. ILLICK

Bulletin 26

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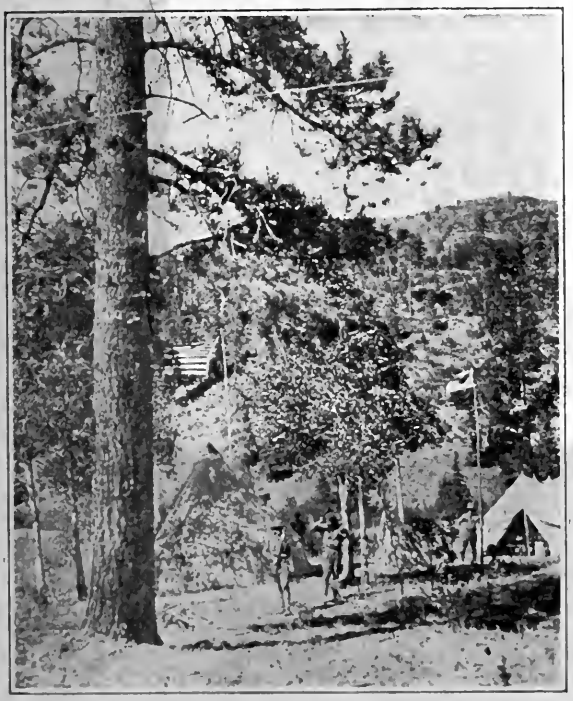

PENNSYLVANIA DEPARTMENT OF FORESTRY

R. Y. Stuart, Commissioner.

GUIDE TO FORESTRY

BOOK ONE

BY

JOSEPH S. ILLICK

Bulletin 26

PENNSYLVANIA DEPARTMENT OF FORESTRY

R. Y. Stuart, Commissioner

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FOREST GUIDES

The Pennsylvania Department of Forestry recognizes that the Boy Scout movement is one of the most valuable agencies in the State for the elimination of FOREST FIRE. With the approval of National Boy Scout Headquarters, the Department has adopted the official designation, Pennsylvania Forest Guides, to be conferred on any registered member of the Boy Scouts of America, resident of Pennsylvania, who signs a Pennsylvania Forest Guide pledge card to be supplied by the Department of Forestry, Harrisburg, Pa.

Each Pennsylvania Forest Guide will be supplied with a bronze button and a book "GUIDE TO FORESTRY" after he has signed the pledge card. Scoutmasters and other Scout officials signing the pledge card will be given white metal "Pioneer Forest Guide" buttons.

Each Pennsylvania Forest Guide or Pioneer Guide who has been available for service for a whole year in the fight against FOREST FIRE, and responded to all calls for such service, can, upon the recommendation of his Scoutmaster, exchange his Pennsylvania Forest Guide button for a Forest Guide badge at the office of the District Forester.

The Department of Forestry also offers 100 gold medals annually to Boy Scouts for special meritorious service in combating FOREST FIRE in Pennsylvania. It is hoped that all registered Scouts will take advantage of this offer, and help to protect the forests from FOREST FIRE—EVERY MAN'S ENEMY.

Boys who do not belong to the Boy Scout organization can become **AMERICAN FORESTRY GUIDES** by applying to the American Forestry Guide Headquarters, 431 Elm Street, Reading, Pa.

FOREST GUIDE OF PENNSYLVANIA

TO WHOM IT MAY CONCERN:—This is to certify that the bearer hereof is a registered member of the Boy Scouts of America, and having signed the Forest Guide pledge, is authorized to wear the Forest Guide button. The citizens of Pennsylvania are hereby requested to extend all possible courtesies to him as a Forest Guide.

R. Y. STUART, Commissioner of Forestry.

....
(Signature of Scoutmaster) *(Authorized representative of Local Council)*

Date

.....

FOREST GUIDE PLEDGE

Believing as a Boy Scout that every citizen should endeavor to see that our Forests, together with their Wild Life and Plant Life, should be protected and conserved for our common good, I do hereby pledge myself to do nothing willfully or carelessly to injure any Forest Tree, Wild Plant, Bird, or harmless Animal, to do all in my power to protect and conserve the same, to urge others to do likewise, to prevent and extinguish forest fires.

Signature.....
(Scout)

Troop No. of Penna

AN APPRECIATION OF SCOUTING

Scouting is worth while. It makes real boys and girls and then turns them into real men and women. A good Scout makes a good American. A good American makes a good citizen, and good American citizens make America the first Nation in the world.

Scouting is good fun, but it is a lot more than that. It is the best kind of preparation for whatever life is to bring in the days ahead. A good Scout is seldom or never caught unprepared, and a man or a woman who has grown up out of a boy or girl scout is always ready to meet the present and future with head up, eyes front, and shoulders back.

There is a lot more in the United States than can be seen from a street car. It is the land, and the boys and men, girls and women who know the land, who make the strength of this and any other country. Not the least valuable thing about scouting is that it teaches the city boy and girl to know the country, and the country boy and girl to know the country better than he or she otherwise would.

The forest is not only the mother of the fountain, but the mother of men as well. Our ancestors lived in the forest. We live with the help of the forest. Wood is still the most useful of all materials, and will continue to be for many years after you and I have passed to our reward.

Boys and girls who know the out-of-doors render services of great value to their Nation and State by understanding the forest and taking part in its protection. It is just as important for people to think rightly about preventing forest fires as it is for them to think rightly about preventing fires in a town, or any other similar calamity. When you help to make people respect and appreciate the forest you help in its protection.

An understanding of the forest and of the conservation of all natural resources is growing rapidly among Scouts. In two years the number of badges awarded to boy scouts in forestry grew from 153 to 513. I would like to see still more awarded in Pennsylvania.

This booklet is prepared primarily for the Boy Scouts of America, Forest Guides, American Forestry Guides, Wood Craft League, Knights of St. George Cadets, Camp Fire Girls, Girl Guides, and other junior outdoor organizations in Pennsylvania. I hope that every boy and girl who gets this book will not only study its pages but take it into the forest, compare what is here printed with what they find out-of-doors, and so get to know the forest which is the home of scouting and woodcraft and a great necessity for the welfare of the human race.

GIFFORD PINCHOT

PENNSYLVANIA DEPARTMENT OF FORESTRY

STATE FOREST COMMISSION

R. Y. Stuart, Commissioner of Forestry.

Edward Bailey.

Henry W. Shoemaker.

Mrs. John L. Lawrence.
(Mary Flynn Lawrence.)

Henry S. Drinker.

Lewis E. Staley, Chief, Bureau of Operation.

George H. Wirt, Chief, Bureau of Protection.

John W. Keller, Chief, Bureau of Silviculture.

Alfred E. Rupp, Chief, Bureau of Lands.

Joseph S. Illick, Chief, Office of Research.

W. Erdman Montgomery, Chief, Office of Maintenance.

A. O. Vorse, Chief, Office of Information.

E. A. Ziegler, Director, State Forest Academy.

GUIDE TO FORESTRY

Book One

By JOSEPH S. ILLICK

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The mere mention of the name Robin Hood among a group of boys kindles a desire to go to the woods. There is only one way to satisfy this desire which is inborn in almost every American boy, and that is for him to get ready and go out along the beaten and unbeaten paths of the forests, and there fill up on the many good things which our forests hold in store for us.

Where is the boy who has studied American History and not been inspired by the adventures and heroic deeds of Daniel Boone, Andrew Jackson, Abraham Lincoln, and Theodore Roosevelt. It is the lives of these men that appealed to every boy. Becoming woodswise, learning by doing, being brave, chivalrous, resourceful and leading a simple, clean, and useful life are worthy qualities which should be developed in all the boys of our great Commonwealth.

There is no better place than in the forests for boys and girls to frolic and receive their instruction. Most of their doings relate to the forest, and the whole scheme of their instruction has its setting in the woods. The forest environment offers the best place to seek adventure, to become hard and handy, to think quietly, to identify rocks, to study trees, and learn the need for forestry.

The original forests, which formed the background for the unusual deeds of the early pioneers, are now practically all gone in Pennsylvania. Only a few small and widely scattered patches remain, and these are beginning to show man-made marks of travel and work. A short description of the original forest follows. It is written with the hope that it will help the boys and girls of to-day realize more fully the real thrill of pioneer life, and picture the trials and toils of Daniel Boone and other early explorers.

THE ORIGINAL FOREST

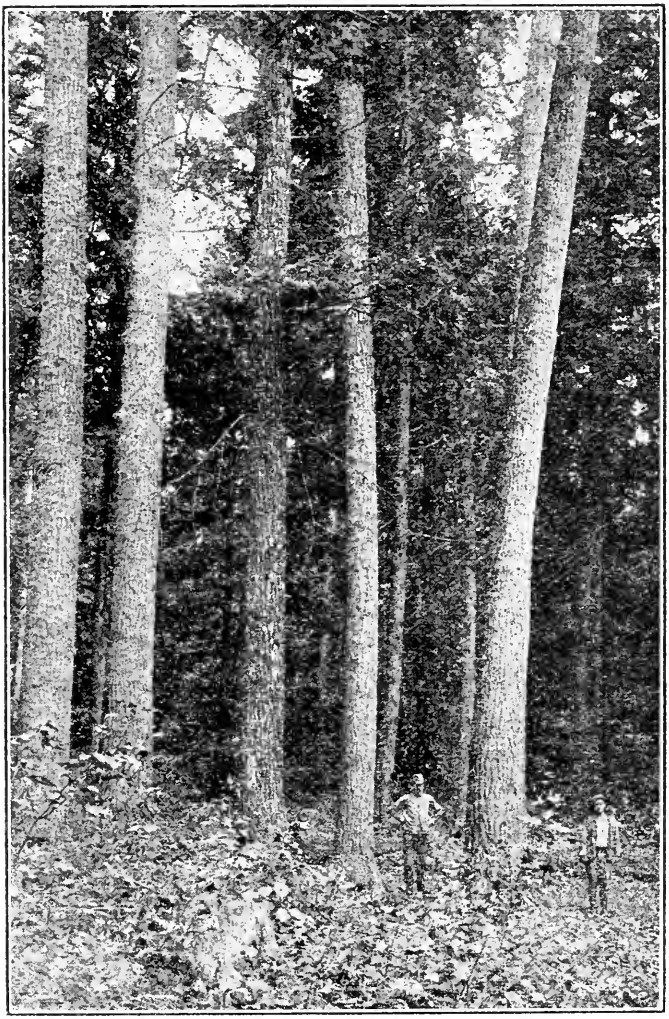
The early American pioneers were confronted on all sides with forests. There seemed to be no end to the woods in those days. They extended practically unbroken from the Atlantic Ocean to the prairies beyond the Mississippi River. They also covered most of the Rocky Mountains and occupied a wide strip on the Pacific Coast. In the aggregate the original forests covered 822,000,000 acres, that is, an area about 30 times the size of the State of Pennsylvania.

The vast extent of the original forests was only one of their characteristics. They contained a large variety of trees which attained a great age, reached a large size, and produced enormous quantities of the choicest lumber ever found on the face of the earth. Nowhere was an equal area ever found which contained such vast quantities of forest products suitable for the needs of man.

Nature made Pennsylvania a great and prosperous State. No phase of her progress is more striking than that which relates to her forests. The entire State with the exception of a few natural meadows and a small number of rough mountain tops was covered with a dense forest growth. No better and more valuable stands of timber could be found in any of the eastern states.

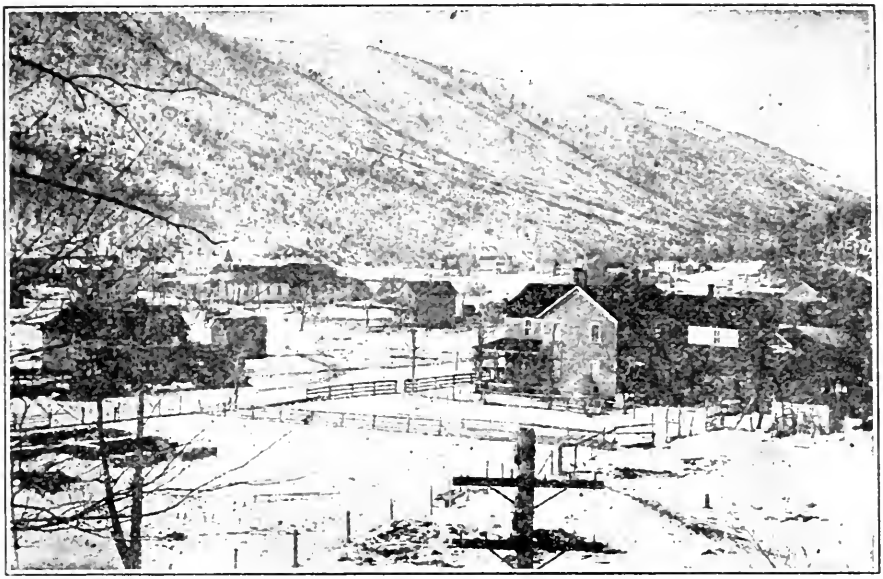
The word Pennsylvania means Penn's woods. The name was derived from the first proprietor of the province and the dense and heavy forests which practically covered all her soil. It required many centuries of Nature's best efforts to produce these matchless and supposedly endless miles of primeval forest, which the first settlers found upon all the hills and in every valley of our great Commonwealth.

The primeval forests, untouched by the axe or saw of man, were a wonderful environment for the pioneer boy. His was not an easy environment, but one full of rich and original experiences. It made him hard, handy and healthy. It brought out the best that was in him. But, we of to-day must not forget that much was required of him. His tasks were hard. He had big jobs to do, the finishing of



THIS IS THE FOREST PRIMEVAL.

Pennsylvania originally had more than 28,000,000 acres of original forest, of which less than 25,000 acres now remain.



A FOREST TRAGEDY.

The forests of big trees have been cut, the land is idle, and the inhabitants of this once prosperous lumbering town are nearly all gone. In its prime the town of Cross Fork, Potter County, had over two thousand inhabitants; now less than twenty people live there.

Photo by J. S. Illick.

THE MARCH OF FOREST DESTRUCTION.

The lumberman fells trees, then forest fires rage, and thereafter only acres of desolation remain

which required many days of hard work in some remote clearing in the woods where human companions were unknown and travelers rarely ventured. To be a pioneer boy means much more than being able to help fell trees, build log cabins, and work in the small family clearings.

The pioneer boy was assigned to outpost positions on the danger line about the forest border. He helped to provide for his family, and protect his friends from numerous and treacherous enemies. His duties required that he become acquainted with the fundamentals of woodcraft. He learned to know the animals of the forest, and studied the ways of the wild folks. He became acquainted with the trees and other plants of the forest. He knew the trees which produced valuable wood, and could recognize the medicinal herbs. The pioneer boy was indeed rich, not in money but in knowledge and ability. He knew his environment and could do things. He was a keen observer, fearless explorer, and a cheerful doer of many good and useful deeds.

Every boy of to-day can find some characteristics or virtues of the pioneer boy of the early days which are worth striving for. There is only one way to get these virtues, and that is the best way. Go out in the glorious and boundless out-of-doors, do the things the pioneer boy did, and learn your lessons as he learned his.

THE MARCH OF FOREST DESTRUCTION

Pennsylvania has a land area of 28,692,480 acres. Almost every acre was covered originally with an excellent forest growth. But a great change has taken place since the days when the early settlers began building their cabins and clearing their fields. To-day only a few small patches of the original forest remain. Where once stood heavy stands of the choicest white pine, hemlock, cherry, oak and other important timber trees, there exist now only endless stretches of barren mountain land. The questions which naturally follow are: What brought about this rapid change? Who were the chief agents of forest destruction?

There were a number of agents of destruction, but man played the leading role. He felled the monarchs of the forest, operated sawmills, and started forest fires. Even before Penn arrived in 1682, the Dutch and Swedes had sawmills on the "South River" as the Delaware was then known. But they were few in number and did not cut much timber. The date when the first sawmills began operating in some of the counties of the State is given in the following table:

COUNTY	YEAR
Philadelphia	1662
Franklin	1732
Berks	1735
Lycoming	1773
Allegheny	1776
Huntingdon	1786
Wyoming	1793
Warren	1800
Clarion	1805
Elk	1825

It was not until 1838 that the first sawmill was erected in Williamsport. This was the actual beginning of the great lumber industry of Pennsylvania, which was at its best between 1870 and 1890. In 1850 the lumber output of Pennsylvania was surpassed by only one state—New York—and in 1860 the Keystone State stood at the very top. She maintained a rank of first or second until 1890, when she took third place. Fourth place was given her in 1900, and by 1918 she had dropped down to the twentieth place, which position she is still holding.

Pennsylvania's fall as a timber producing state was rapid. It could not have been otherwise, for her forests were gone. Just thirteen years ago as much wood was cut in Pennsylvania as her citizens and industries used. Now the annual cut of wood is only one-third as much as we consume, and what is far more significant, our forests are growing only about one-tenth as much lumber as we use.

The great and glorious lumber industry flourished for a short while in Pennsylvania. It brought much business to the State, but left a big blot on its otherwise wonderful and prosperous record —**THE PENNSYLVANIA DESERT.** There are in our State to-day six million acres of mountain land, which can produce only one crop, and that is a forest crop. This area is too rough and rocky for the plow; but if handled properly will provide a continuous flow of valuable and necessary forest products.

We do not want to keep this unproductive desert. To do so would be entirely wrong and selfish, and show poor foresight. It becomes us to show our worth and good sense by treating these six million acres in such a way that a full crop of necessary forest products will flow from them continuously.

THE PRESENT FOREST SITUATION

We do not have enough wood to satisfy fully the present demands. It is becoming scarcer each year and the prices are rising rapidly. Wood will forever be a human need. It is used in the in-

dustries, the home, and the fields. It is an element of human necessity from the cradle to the coffin. Next to food and clothing it is the most indispensable product of nature. We are now in the early stages of a timber shortage, which we must not allow to grow worse, for without wood there can be no agriculture, no manufacture, no commerce.

Most of the work of reclaiming Pennsylvania's Desert will fall to young people. They are the ones who look forward and want to set things aright. It is they who are building for the future, and concerned with the problems which require a long time to complete.

The boys and girls of Pennsylvania can render a great and lasting service by helping in the restoration of a forest growth upon Pennsylvania's Desert. They can at least do a part of this fine piece of work. In fact, they have started upon the job already, are taking it seriously, and making commendable progress. Boys are helping to extinguish forest fires in every part of the State. In some cases they put out fires without any help. They have also reported many fires to forest officers. A troop of Boy Scouts fought a fire strenuously for one day and night and conquered it completely. It will ever be to their credit for having worked so hard and accomplished so much. The Scouts have also planted many trees, cleaned up the forest of weeds and debris, improved springs, built trails, and cared for birds and other wild animals. They have done much good, which is being appreciated and will live long after them.

But in order that every boy and girl may do his and her part well, and probably better than would otherwise have been possible, this little booklet has been prepared. It does not aim to tell all about the forests or point out all good forestry practices, but its purpose is rather to impress our young folks with a few of the most important things which they should know, and do in order that they may help protect and improve our forests.

FOREST AREA OF PENNSYLVANIA

Pennsylvania was originally one of the best, if not the very best, wooded state in the eastern half of our country. The total land area of Pennsylvania is usually given as 28,692,480 acres. Practically the entire state, with the exception of a few natural meadows and several rough mountain tops, was originally covered with trees.

The opening of agricultural lands, lumbering operations, forest fires, and other agents of forest destruction, have reduced this acreage considerably. The following table gives the present forest area of Pennsylvania by counties:

COUNTY	TOTAL FOREST AREA (ACRES)	COUNTY	TOTAL FOREST AREA (ACRES)
Adams,	99,262	Lackawanna	110,020
Allegheny,	109,200	Lancaster,	99,177
Armstrong,	127,913	Lawrence,	48,951
Beaver,	77,362	Lebanon,	41,650
Bedford,	276,000	Lehigh,	47,500
Berks,	115,096	Luzerne,	380,827
Blair,	136,704	Lycoming,	489,855
Bradford,	304,416	McKean,	565,000
Bucks,	63,304	Mercer,	106,650
Butler,	105,565	Mifflin,	160,251
Cambria,	256,972	Monroe,	210,000
Cameron,	197,500	Montgomery,	47,200
Carbon,	124,800	Montour,	33,280
Centre,	496,013	Northampton,	39,700
Chester,	88,676	Northumberland,	92,000
Clarion,	153,000	Perry,	184,039
Clearfield,	500,000	Philadelphia,	4,500
Clinton,	453,608	Pike,	261,118
Columbia,	137,952	Potter,	509,921
Crawford,	210,000	Schuylkill,	325,000
Cumberland,	97,423	Snyder,	67,000
Dauphin,	97,603	Somerset,	399,960
Delaware,	15,000	Sullivan,	210,000
Elk,	417,000	Susquehanna,	180,000
Erie,	80,000	Tioga,	375,440
Fayette,	335,000	Union,	98,440
Forest,	233,648	Venango,	176,000
Franklin,	153,303	Warren,	395,486
Fulton,	140,000	Washington,	76,861
Greene,	89,420	Wayne,	283,707
Huntingdon,	355,000	Westmoreland,	215,450
Indiana,	176,000	Wyoming,	139,744
Jefferson,	221,000	York,	119,630
Juniata,	108,500		
		Total Forest Area	13,046,557

A study of the above table shows that seven adjoining counties, located in the north-central part of the State, comprise more than one-fourth of the total forest area of the State. These counties are McKean, Potter, Clearfield, Centre, Lycoming, Clinton, and Elk. It is quite significant that while the seven counties comprise more than one-fourth of the total forest area, they make up less than one-twenty-third of the State's total population. The county having the largest forest area is McKean. It has a total land area of 631,680 acres of which 565,000 acres, or 89.4%, is forested.

There are six counties in the State of Pennsylvania that have more than 75% of their total land area in forests. They are McKean, Forest, Elk, Clinton, Cameron, and Pike. It is significant that twenty-six of the sixty-seven counties of Pennsylvania have more than 50% of their total land area in forests, and that 45.5% of the total land area of the State is forest land.

There are in Pennsylvania 13,046,557 acres of forest land and 8,720,017 inhabitants. This means that there are one and one-half acres of forest land for each inhabitant of the Keystone State. A study of the forest area and population of each county shows a wide variation. There are in the State twenty counties that have less

than one acre of forest land for each inhabitant; twenty-four counties that have from one to ten acres of forest land to each inhabitant; ten counties with from ten to fifteen acres of forest land to each inhabitant; and only three counties that have more than twenty-five acres of forest land for each inhabitant.

The forest area per capita ranges from .0025 acres in Philadelphia County to 38.3 acres in Pike County. The counties having the largest forest acreage per capita are:

COUNTY	FOREST AREA PER CAPITA (Acres)
Pike,	38.3
Cameron,	31.4
Forest,	31.0
Potter,	24.2
Sullivan,	22.1

Some of the counties having the smallest forest area per Capita are:

COUNTY	FOREST AREA PER CAPITA (Acres)
Philadelphia,	.0025
Delaware,	.09
Montgomery,	.2
Lehigh,	.3
Northampton,	.3
Washington,	.4
Lackawanna,	.4
Erie,	.5

The forest land of Pennsylvania may be placed in the following classes:

	AREA (Acres)
State forest land,	1,126,237
Farm woodlots,	4,043,902
Outside of State Forests and farm woodlots,	7,876,418
Total,	13,046,557

WHAT A FOREST IS

A forest is a complex community of living things. It is more than a mere collection of trees, for associated with the trees are many

other plants and animals, all of which live in close relationship with one another.

There is a right and a wrong way for boys and girls to find out what a forest really is. Many hours may be spent in schoolrooms, libraries, and parlors studing about the forest and its inhabitants. Such a method has some good points, but there is a better way. The right way to become acquainted with the inhabitants of forests consists in getting ready, going out, hiking right into them and there beginning a first-hand acquaintance with the many and interesting members of which it is made up.

Do not plan to become acquainted with all the forest inhabitants on the first trip into the woods for there are too many of them. Just as it is impossible to become acquainted with all the inhabitants of a city in a single day, so it is beyond the realm of the possible to learn to know all of the members of the forest on a single hike.

A good plan for the first hike to the forest is to list or make a census of all the different groups or classes of plants and animals which you may observe, that is, make no special attempt to name the individuals. This may be done by making a table of two columns, the one with the heading **Plants** and the other **Animals**, and listing under each all the living things observed. Only two columns are required, for all living things are either plants or animals. The table may be made up in the following manner:

PLANTS	ANIMALS
1. Trees	1. Deer
2. Shrubs	2. Squirrels
3. Ferns	3. Rabbits
4. Mosses, etc.	4. Birds, etc.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

Such an exercise will show that while the trees are the most conspicuous and the most important members of the forest, they are by no means its only inhabitants. Instead, the forest is a complex community of many living things, whose activities are so closely inter-related that the absence of any group may make itself felt on all the remaining members.

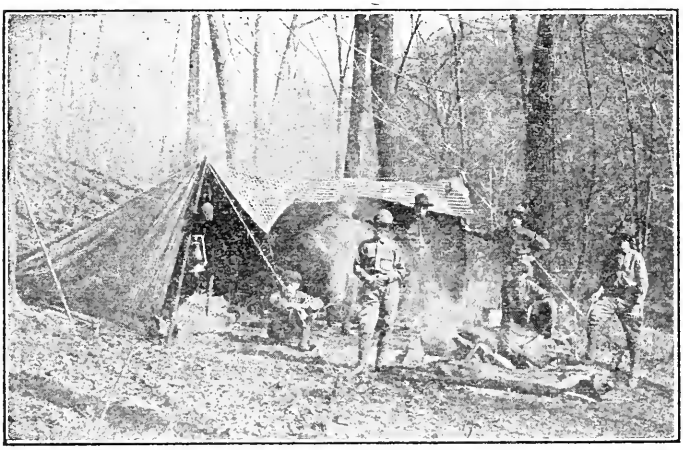


Photo by Charles I. Buvinger.

IT IS EVENING. ALL IS WELL WITH THE SCOUTS AND EVERYBODY IS HAPPY.

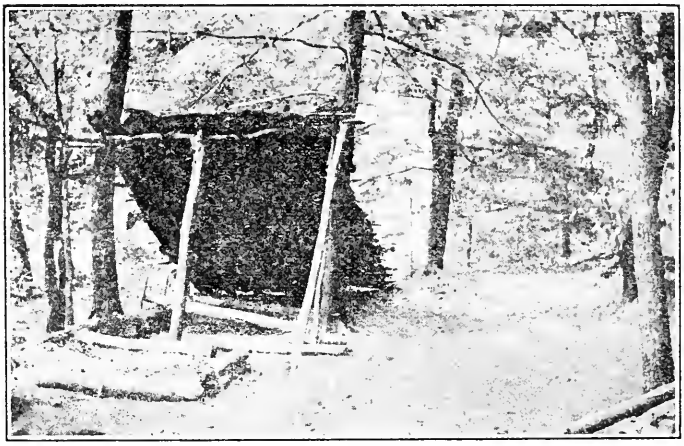


Photo by Charles I. Buvinger.

A CRUDE BUT COMFORTABLE LEAN-TO SHELTER.

Photo by Charles I. Buvinger.

A LESSON IN NATURE STUDY. BE SURE TO SEE WHAT YOU LOOK AT.

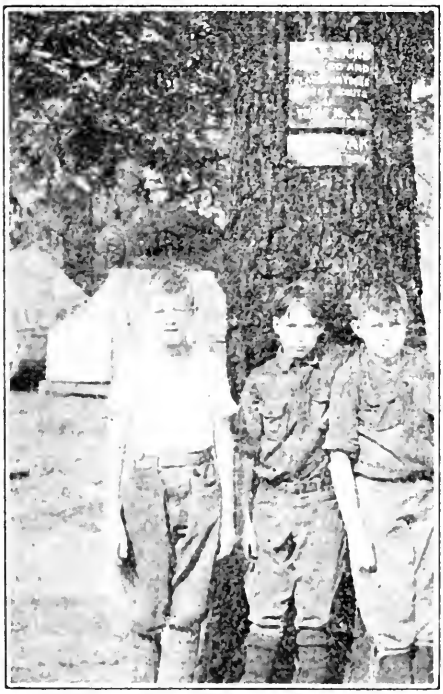


Photo by Charles I Buvinger

A TRIO OF TREE LOVERS.

They have named and identified all the different trees about their camp

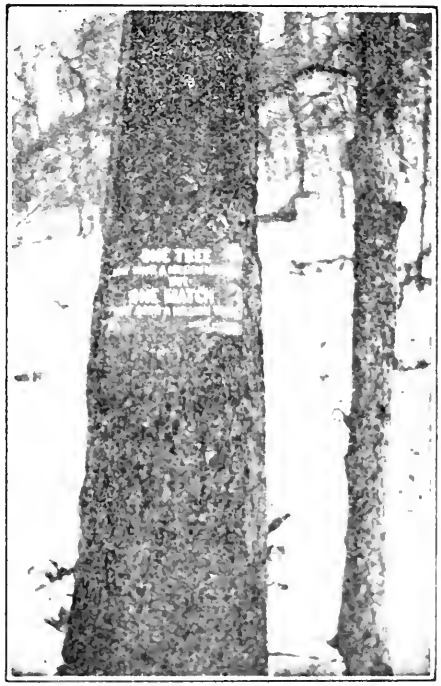


Photo by Charles I Buvinger

IT IS TRUE, ONE TREE MAY MAKE A MILLION MATCHES, BUT ONE MATCH MAY BURN A MILLION TREES.

WHAT FORESTRY IS

Forestry is the art of handling forest land in such a way that it will be of the greatest service to man. It is no field for selfish effort and has no place for a greedy goal. Good forestry considers the wants of future generations as well as our present needs. It recommends the wise use of all forest products now on hand, and insists that a growth of valuable forest trees be maintained continuously on every acre of forest land. Idle acres, barren slopes, areas of desolation, and unproductive land are objects to be overcome and improved.

WHAT IS WRONG WITH OUR FORESTS

That our forests are in urgent need of improvement is no longer a question. Many of them are unattractive; fire-scarred snags, exposed boulders, and bare soil being among their most striking characteristics. Most of them are unsanitary, for they are filled with debris, dirt, half rotten trunks, stumps, and insect infested stuff. All of our forests are producing fewer products than they are capable of turning out. Furthermore, there appears to be no order in them, for they have developed without any attention or care.

A general study of prevailing forest conditions shows that the forests of to-day fall short of being satisfactory in at least four important ways:

1. **They do not produce enough good wood.**
2. **They are not attractive in appearance.**
3. **They are positively unclean.**
4. **There is no order in them.**

The boys and girls cannot do all the things or carry on all the operations which are necessary to bring about the desired improvements, but there are a number of lines of work which they can and should do; and it is equally important to know that there are other things that should not be done. Here are some suggestions:

1. **Do not start a forest fire.**
2. **Tell all your companions about the damage which forest fires do.**
3. **Report all forest fires to the nearest forest officer.**
4. **Learn how to fight forest fires, and take a hand in putting them out.**
5. **Plant forest trees in vacant corners, wasteplaces, abandoned fields, on barren mountain slopes and other unoccupied forest land.**
6. **Destroy insects which injure and kill forest trees.**
7. **Destroy rots, blights, and other fungous foes of the forest.**
8. **Help clean up the forest by using the dead wood found lying on the forest floor.**
9. **Cut out only undesirable trees and guard the more valuable ones.**

HOW FOREST FIRES START

Someone may have told you that lightning causes many forest fires or that spontaneous combustion may furnish the spark which starts the fires on their mission of destruction. In order that we may get at the very bottom of this important subject, and not be misinformed, let us take advantage of the results of a careful study which has been made of the causes of forest fires in Pennsylvania. They may be summarized as follows:

1. Few, if any, forest fires are the result of spontaneous combustion.

2. Lightning does not cause more than 10 or 12 forest fires each year in Pennsylvania, that is, about four-fifths of one per cent. of the total number.

3. Someone's carelessness or neglect causes 99 per cent. of the forest fires which occur each year in Pennsylvania. No matter what the immediate or apparent cause happens to be the real original cause can in almost all cases be traced back to the carelessness or neglect of some person or group of persons. Carelessly constructed or neglected camp fires have started many forest fires. The careless throwing away of a burning match, cigarette, or tobacco among dry leaves has been the cause of some of our worst fires. Sparks from engines start many forest fires, but the real cause is the fact that the smoke stacks were not properly equipped with a satisfactory spark arrester, or a satisfactorily cleared safety strip was not kept on both sides of the road bed. We all believe in clearing up unsightly and unsanitary places, but too often brush burners choose a windy day or forget to take proper precaution so that the fires which they start cannot get away from them. In many instances those in charge of a fire go away for a while, only to return and find that the fire has escaped and is traveling rapidly over an adjoining woodlot or ascending a steep and heavily timbered mountain slope.

4. Be sure the camp fire is out before leaving it. Take no chances, for you can easily tramp it out, smother it with ground, or soak it with water.

5. Be very careful in cleaning up a camp site. Burn the undesirable material when there is little danger of the fire getting beyond control.

6. Be as careful with fire in the forest as in your home, for it is an evil doer if it gets beyond control. Careful boys and girls take no chances with fire in or near the woods, for its actions are treacherous and its destructive power great, if it gets beyond control.

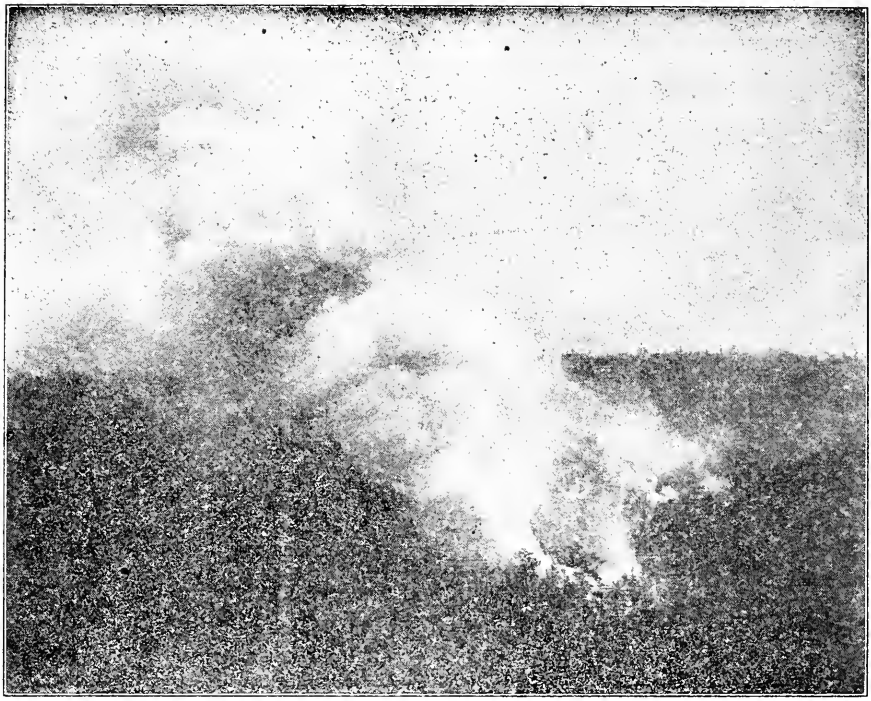


Photo by J. S. Illick.

FOREST FIRE IS EVERY MAN'S ENEMY.

Be sure to look over a forest fire before you tackle it, but do not lose much time. Watching and waiting will not do the work. Locate the "header" and fight it first The "header" is the part of the fire that travels most rapidly. The top of a ridge, or just beyond the top and right in front of the "header" of a fire, is the right place to get busy.

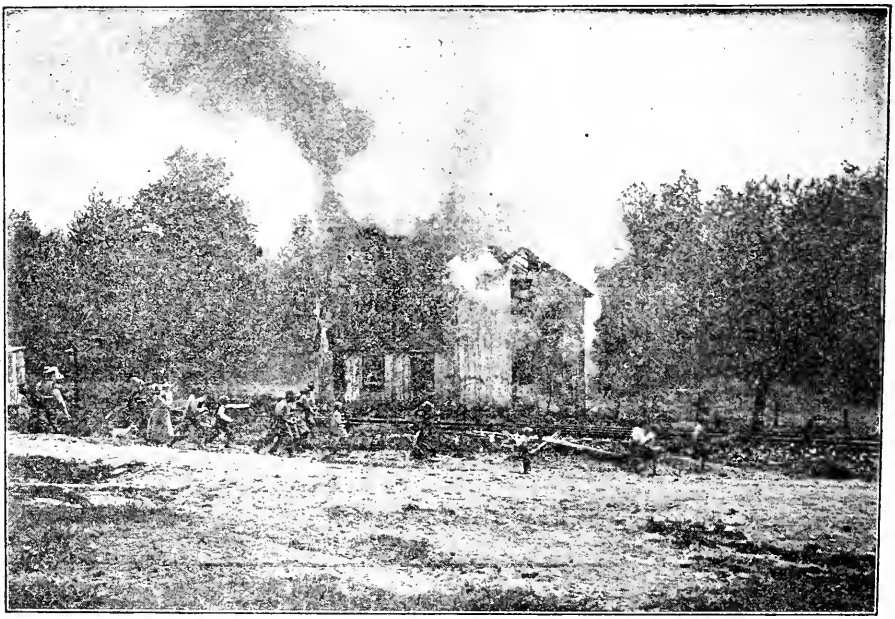


Photo by J. S. Illick.

FOREST FIRES MAY DESTROY HOMES.

There is no end to the damage that forest fires do. In 1918 nearly 400 persons lost their lives in a single forest fire in Minnesota, about 2,000 were more or less seriously burned, and 13,000 rendered homeless.

A MODERN STEEL FOREST FIRE TOWER. IT IS 60 FEET HIGH AND FROM ITS TOP MAY BE VIEWED 500,000 ACRES OF FOREST LAND.

WHAT FOREST FIRES DO.

The first thing that every boy and girl should know about forest fires is the fact that they do absolutely no good. They bring no benefits to mankind, for damage and loss are the results of their work. It would require many pages to discuss fully the loss caused by forest fires. The following outline will show some of the damage which they do:

1. Forest fires destroy the beauty and value of a region.
2. They destroy the animal and plant life of the forests.
3. They destroy the seeds and seedlings which would develop into stately stands of timber.
4. They kill enormous quantities of growing timber.
5. They consume a large amount of felled timber and other forest products stored in forests.
6. They consume the leaf litter and humus on the forest floor.
7. They impoverish the soil to such an extent that its capacity to produce timber is almost negligible. Briefly, they prevent the production of enormous quantities of needed forest products.
8. They have already made a big desert in Pennsylvania. It covers a large part of the mountains of our State.
9. They open the way for the destructive work of insects, fungi, erosion, floods and drought.
10. They sometimes kill live stock, and frequently destroy buildings, crops and fences.
11. They occasionally destroy houses.
12. They even may cause the loss of human lives.

There appears to be no end to the damage which forest fires do. We cannot let them go on. It is our duty to step in right now and fight them to a finish.

WHY PREVENT FOREST FIRES.

There are many reasons why forest fires should be prevented. It would make a list as long as an arm if an attempt were made to name them all, but everyone cannot help but become enthusiastic about preventing forest fires after knowing that:

1. Forest fires are unnecessary. There exists no need for them and they should be stopped.
2. Forest fires benefit no one, except a few selfish people who still have the false notion that forest fires are necessary to insure a crop of Huckleberries.

3. The prevention of forest fires is good business, for they are the curse of our forests. They do only evil. No good comes from them. We endure hardship and suffer great loss because of them.
4. They are responsible for the greatest leak which exists at the present time in our otherwise prosperous Commonwealth.
5. The prevention of forest fires is wise forethought, for they are not only destroying annually an enormous quantity of wood, but also prevent an inestimable amount of wood from growing. It is our duty to stop them now, because of the damage they do, and the hardships which will bear down upon future generations through a shortage of forest products.

HOW TO PREVENT FOREST FIRES.

It seems to follow from the study of the causes of forest fires that the best way to prevent them is to have every inhabitant and every visitor of our Commonwealth be careful and thoughtful about the use of fire in all forms and at all times. The following suggestions should be helpful in out-of-door activities:

1. Be sure you do not throw away a lighted match or any other burning material while walking through, resting, or camping within the woods.
2. Clear the ground of all inflammable material before building a camp fire. If possible, dig a small pit in a clear area, and surround it at least on three sides with a wall of stones. This makes an ideal and safe fire place.
3. Never build a big fire. It is neither necessary nor safe.
4. Of course, most boys do not smoke, but if you are allowed to smoke or choose to "steal a smoke," be very careful in disposing of the burning tobacco, cigar, or cigarette. Many a forest fire was started by a carelessly disposed of cigar or cigarette, and the thoughtless throwing away of burning tobacco.

HOW TO FIGHT FOREST FIRES.

Someone has said that the best way to fight forest fires is to prevent them from starting. That is good advice and a fine idea, but some fires will start and must be fought. The putting out of a forest fire is a real fight. It is one of the severest contests a group of young men can engage in. Forest fires are a difficult enemy to overcome, for their advances are usually fierce and uncertain.

In order to overcome them quickly the fighters must take heart, and then "dig in" and use their heads, hands and feet with all their might. By so doing they will be able to conquer the most formidable foe of the forest.

The best results will be obtained if the fighting force is well equipped, properly organized, and so trained that every member understands the most important rules of the business. A schedule follows which points out some of the most imporant things which should be done in case of forest fires.

1. Always be on the watch for forest fires, especially during the spring and fall when they are apt to occur and in regions where they happen frequently.
2. The first thing to do, if you are at or near a fire when it starts, and it is not too large, is to try to put it out.
3. The first thing to do, if you are at a distance from the fire, or if it is large in size and burning rapidly, is to notify the nearest forest officer, who may be a Forester, Forest Ranger, Forest Fire Warden or Game Warden.
4. The second thing to do is to get together a crew of fire fighters.
5. See to it that the fighters are properly equipped.
6. Get the fighters to the fire as soon as possible. The secret of success in fighting forest fires is to knock, kick or otherwise get them out in the first round, for they become larger and stronger the longer you allow them to go ahead.
7. As you approach a fire look it over and proceed to take the best position to attack it. Always tackle "the header" first, that is the part of the fire which is traveling fastest.
8. Upon reaching the fire, offer your service to the forest officer in charge. If no forest officer is present, organize your men and tackle the fire without delay. Lose as little time as possible in discussing the situation.
9. A slow fire may be stopped by beating it out, but in cases where fires are progressing very rapidly, it is best to clear a line about two feet wide of all inflammable material some distance ahead of the fire. If the fire is not advancing too fast it will stop when it reaches this cleared line, but if a strong wind is blowing it is very apt to jump over the cleared line and proceed onward doing destructive work. In the case of rapidly advancing fires it is recommendable to start a "Back Fire" on the side of the cleared line towards the original fire, and when they meet, both will die out for want of inflammable material. A "Back Fire" improperly placed or poorly timed may do more damage than good. Therefore, no "Back Fire" should be started by boys

unless a forest officer, or another person who has had experience in fighting forest fires, is at hand to direct the fight.

10. One of the most responsible positions on a fire line is that of the "guards" who control the back fire and see to it that the fire does not jump over the fire line.

11. Do not expect every established fire line to hold, for you will sometimes be compelled to fall back, reorganize the fighters and begin to battle from a new and more advantageous position.

12. Do not give up until you have won the fight. Remember that the fight is not really won until the last spark is out. Therefore, do not leave a fire immediately after the flames have been subdued, but patrol the lines and see to it that it does not break out anew and go on another spree of destruction.

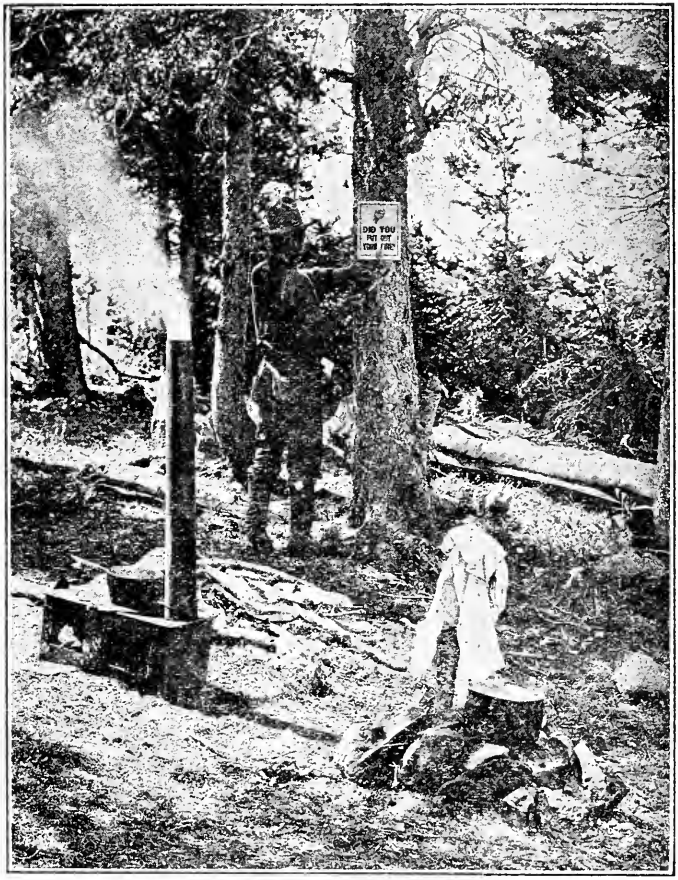
OTHER THINGS TO DO.

The stopping of forest fires will do much to rebuild our devastated forests, but there are other things which must also be done in order to place them in a satisfactory condition. These important tasks should go hand in hand with or follow right after protection. Some of these essential things are:

1. Securing a new growth of valuable trees as quickly as possible on every acre of devastated land within the State. We cannot afford to leave so many acres of mountain land remain idle. It does not pay to delay. Right now is the time to see to it that all unproductive areas of forest land are so stocked with trees that they will begin to produce a valuable forest crop.

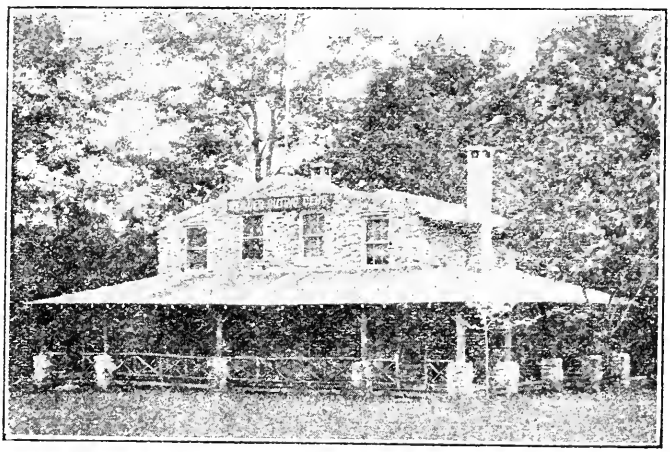
2. Another thing to do is to give preference to the important forest trees and eliminate as rapidly as possible the undesirable kinds. There are over 100 different kind of trees and about 200 different kind of shrubs native to Pennsylvania. Nature does not show any preference for the important timber trees in the early stage of reforestation. As a rule, many different kind of trees come up after forest fires and lumbering operations, and in the struggle for an existence the inferior ones often win out. If the job of restocking our forest land is left to nature entirely, a great deal of ground will be occupied by worthless trees. It is our business, therefore, to learn to know the best trees, and then help them overcome inferior ones such as scrub oak, fire cherry, trembling aspen, sumachs and other similar weed trees. While in camp boys and girls should show their appreciation of the land owner by helping him improve the composition of his forest by cutting out the inferior trees and thus help those of better quality.

3. A third thing which is essential to rebuilding our forests properly is the removal from the forests of all trees of



Courtesy of the U. S. Forest Service.

BE SURE THAT THE CAMP FIRE IS OUT BEFORE YOU LEAVE.



A COMFORTABLE CAMP ON THE MOSHANNON STATE FOREST IN PENNSYLVANIA.

There are 563 permanent camp sites under lease on the State Forest of Pennsylvania, and during 1921 at least 80,000 people used the State Forests for camping and recreation purposes.

A PLANTATION OF YOUNG WHITE PINE TREES.

Make your idle land pay. Plant forest trees on waste places.

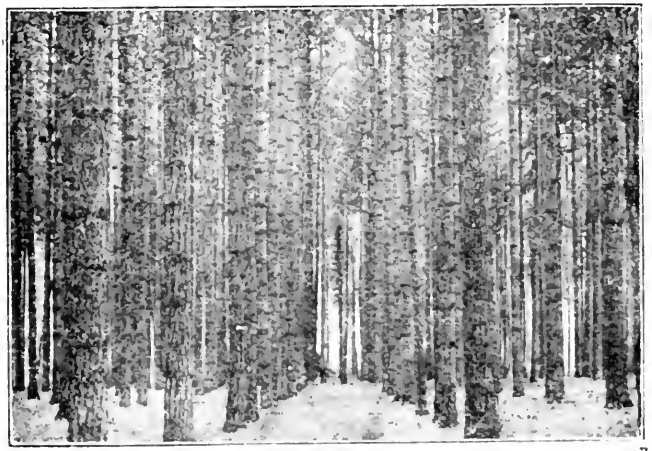


Photo by J. S. Illick.

AN ATTRACTIVE AND THRIFTY STAND OF WHITE PINE PLANTED 48 YEARS AGO.

Note the branch scars that encircle the trunks. The distance between the rings is the height growth of one year.

poor quality, and undesirable form, as well as all dead, dying and damaged specimens. In almost every forest there are wolf trees, that is, trees which are unattractive, have a wide-spreading crown, and a twisted and hollow trunk. Such trees grow very little in size and are continuously decreasing in value. They should be removed from the forest for they possess no future promise, and are suppressing and even killing many young and thrifty trees beneath them. Their days of usefulness and service are past, and the way should be opened up for a younger generation of trees by removing their suppressors.

Boys and girls should make it a rule to use for camping and other essential purposes only such material whose removal will improve the forests, and thus assist in rebuilding them and making them even more productive and more valuable than the original forests.

4. Another important thing to do is to stock completely all forest land so that it will begin producing forest products of value. Our forests are now full of gaps and openings in which nothing of value is now being produced. Many of these areas are small in size, while some of them cover large areas. The loss from a single blank area may not be great, but when all of them are added together the loss is enormous.

Let us give nature a chance to establish forests of baby trees on all these areas, but if she does not succeed, the thing to do is to go out upon these barren areas and plant upon them selected trees, which are well-known, sure to grow, and will produce a valuable crop of timber. We must not compete with nature or try to outdo her in places where she is doing good work, but our aim should be to fill in all fail places. Boys and girls can be of great service in this work for there is a big tree planting job before all of us. It will be a creditable piece of work for the young and brave men of our State to go out among the hills and start to re-clothe them with the best trees which are now available.

WHY PLANT FOREST TREES.

Nature working through many centuries produced the original forest. It took a long time for her to accomplish this wonderful task. In some localities nature will again produce fine forests, while in other places she is making progress very slowly. We cannot afford to wait. We must put our idle mountain land to work at once for we need all the forest products which all the available areas are capable of producing.

Wherever nature is not restoring a forest growth, we may go in and help her by planting seedlings of valuable forest trees. The boys and girls of Pennsylvania have already planted many trees, and it is fair to assume that as they learn more about this delightful

pastime and helpful practice they will plant an increasing number each year. You may not know about it, but it is a fact that almost 50 million small forest trees have been raised already in the nurseries operated by the Pennsylvania Department of Forestry and all of them have been planted on forest land within the Keystone State. More than 34 million of these trees have been planted on the State forests, the remainder having been set out by private owners of woodland. How rapidly the practice of forest tree planting is growing may be learned from the following table:

YEAR	Number of Trees Supplied to Private Planters
1910	66,374
1911	25,360
1912	66,854
1913	47,770
1914	108,685
1915	115,577
1916	1,471,875
1917	1,812,997
1918	2,186,899
1919	3,139,531
1920	2,543,374
1921	3,041,710
Total	14,627,006

Every Pennsylvania boy and girl should be a tree planter. It is a helpful and wholesome kind of work. In order that every boy and girl may know some of the good points of tree planting, a list of the benefits that may be derived therefrom follows:

1. Planted trees will help supply the constantly growing demand for wood. They are a credit to us who set them out, and will be a blessing to future generations. Cheap wood is gone forever in Pennsylvania.
2. Planted trees afford excellent protection to our water supplies and prevent erosion on steep slopes.
3. Planted trees beautify and protect homes and make our landscape cheerful.
4. Planted trees utilize the energies of nature which might otherwise be wasted.
5. Planted trees beautify and improve highways, waterways, and byways.
6. Tree planting will make worthless land productive and yield useful forest crops.

7. Tree planting will help fill up the storehouse of needed wealth.
8. The planted forests of France helped win the war.

There is a great need for forest tree planting. It is not hard to find places upon which trees should be planted. Bare hillsides and poorly stocked mountain land is common, idle corners are present everywhere, and eroding slopes and gullies are doing enormous damage in every community.

Boys and girls should remember that they do not stand alone when they desire to plant trees, for the Pennsylvania Department of Forestry will co-operate with them. It will supply the trees for planting if at least 100 are set out. The only cost attached to the trees is the packing and shipping charges, which should not exceed about 75 cents per thousand. A troop of Boy Scouts in April, 1920, planted one thousand trees upon a hillside near Sellersville, Pa., in about two hours. They enjoyed the work so much that they sent in a "hurry up" order for 500 more, which they also planted and now they are planning to take good care of them and watch them grow in size, value, and beauty.

He that planteth a tree is a servant of God,
He provideth a kindness for many generations,
And faces that he hath not seen shall bless him.

HENRY VAN DYKE

WHY BECOME ACQUAINTED WITH TREES.

Every boy and girl will sooner or later ask themselves the question, why should I put forth any effort to become acquainted with trees for they are such commonplace things? At first they may not be able to satisfy themselves that the study of trees is important, but as they revolve the question in their minds they will begin to see what a wide and practical application to every day life this subject has, and that trees ever since the creation have been among man's best friends and most useful helpers, and as time goes on and wood becomes scarcer they will play an even more important role in satisfying his needs.

Suppose we pause just long enough to think about a few of the ways in which trees have been our friends and helpers. We cannot begin to take an itemized census of all the different benefits derived from them for we would soon have a list as long as our arms and only half finished, but in order that we may not overlook entirely some of their good points a list of the most important of them follows:

1. Trees decorate the landscape. A treeless place is indeed cheerless.
2. Trees supply us with shade and shelter, and protect our houses and other buildings against storms.

3. Trees beautify our homes, highways, and byways.
4. Trees give shelter to and serve as a refuge for birds and other wild-animals.
5. Trees supply shade and shelter to domestic animals when in the open.
6. Trees help make, fix, and improve the soil.
7. Trees protect steep mountain slopes against erosion, and bind the soil along the banks of streams.
8. Trees increase the run-off of water during periods of drought.
9. Trees help purify the atmosphere.
10. Trees decrease the run-off of water during periods of flood.
11. Trees help maintain and improve the health and efficiency of our citizens.
12. Trees help raise the moral standard and social worth of our boys and girls.
13. Trees furnish the raw material for many of our most important industries.
14. Trees supply us with some of our most necessary products of life. They supply us with the wood with which to build, furnish and warm our homes. They are the main source of the raw material from which the paper upon which we write is made.
15. Every Pennsylvania boy and girl should become acquainted with our native trees so that they can recognize the difference between the important timber trees and the inferior (weed) species.

HOW TO BECOME ACQUAINTED WITH TREES.

There is more than one way for boys and girls to become acquainted with our common trees. Some are so fortunate as to have a teacher available who knows the trees and is willing to point out their distinctive features and peculiar habits. Others are less fortunate in that they do not have a teacher familiar with the trees, but they do have available for use a good supply of helpful tree leaflets and manuals. But there is a third group of boys and girls and this includes by far the largest number, who have neither a good teacher nor satisfactory literature available to pursue a course of tree study. It is primarily for this third class of boys and girls that the material on the following pages has been prepared.

One of the first things which boys and girls should know about tree study is the fact that to attempt to learn to know all the trees is a big and long job, for there are over a hundred different trees native to Pennsylvania. It may be well in this connection to remember the old adage "Do not attempt too much for fear of accomplishing too little." Much better results will be attained by selecting a small group of trees, or a certain number of representative

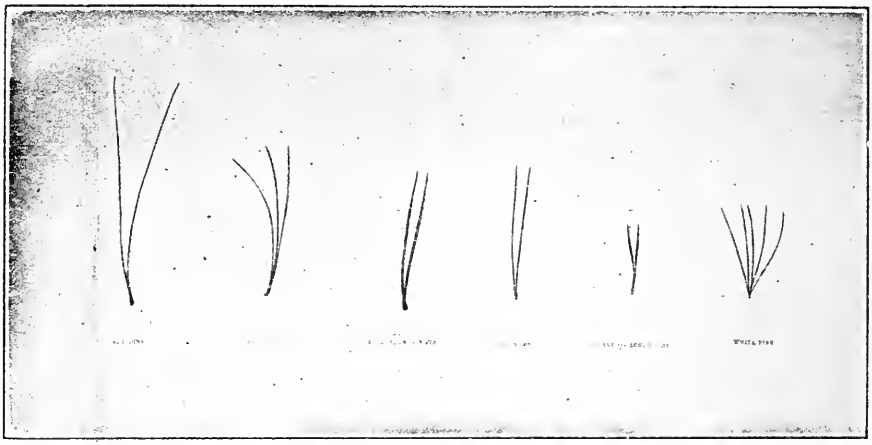


Photo by J. S. Illick.

NEEDLE CLUSTERS OF THE SIX PINES NATIVE TO PENNSYLVANIA

White pine is the only pine native to Pennsylvania with five needles in a cluster; pitch pine has three needles in a cluster; while the other four native pines have two needles in a cluster. Left to right: Red pine, pitch pine, table mountain pine, short-leaf or yellow pine, Jersey or scrub pine, white pine.

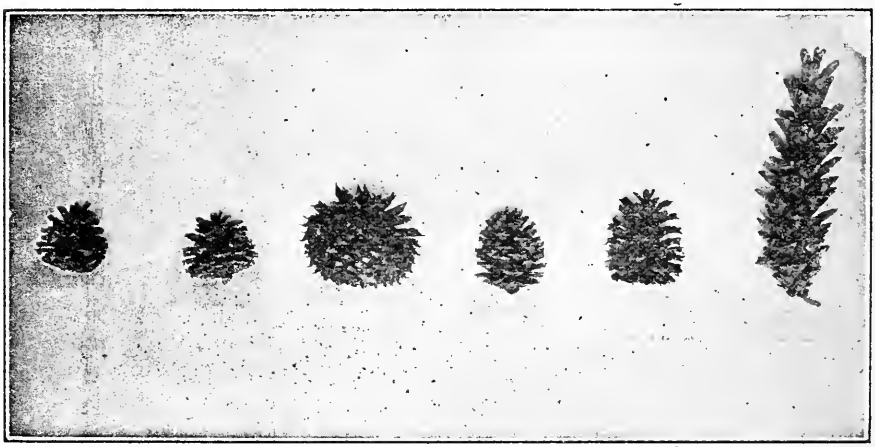
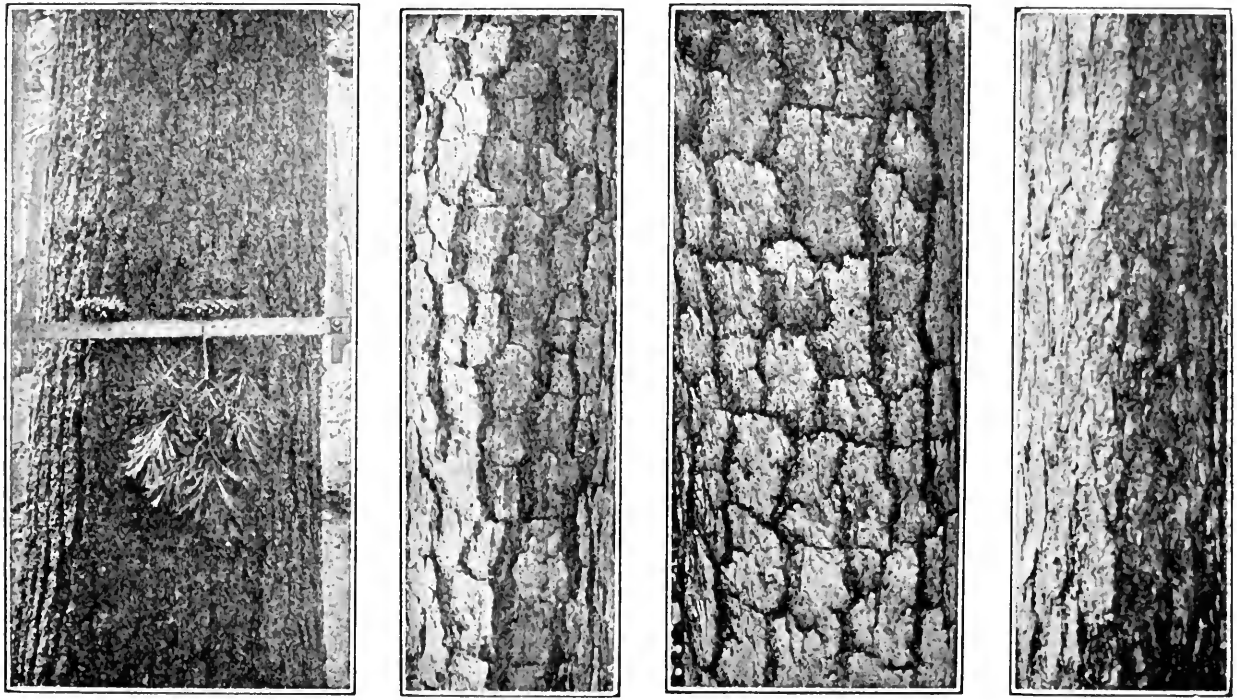


Photo by J. S. Illick.

CONES OF THE SIX PINES NATIVE TO PENNSYLVANIA.

Left to right: Red pine, pitch pine, table mountain pine, short-leaf or yellow pine, Jersey or scrub pine, white pine.



White pine. Pitch pine Red pine.

THE PINES OF PENNSYLVANIA MAY BE DISTINGUISHED BY THEIR BARK.

species and learn to know them well, rather than attempt to master all of them and later on find that you have acquired only a superficial smattering of most of them and know none real intimately.

SOME REPRESENTATIVE PENNSYLVANIA FOREST TREES.

A small number of Pennsylvania forest trees have been selected for special consideration in this booklet. They are fairly representative trees and possess some striking and interesting characteristics. There are many other equally interesting and important trees which may be considered in later editions. The trees that will be described are:

1. White Pine
2. Red Pine
3. Pitch Pine
4. Short-leaf Pine
5. Jersey or Scrub Pine
6. Table Mountain Pine
7. Buttonwood
8. Sassafras
9. Red Mulberry
10. Sugar Maple
11. Red Maple
12. Silver Maple
13. Ash-leaved Maple
14. Striped Maple
15. Mountain Maple
16. Norway Maple
17. Sycamore Maple.

THE PINES OF PENNSYLVANIA.

Six different kinds of pine trees are native to Pennsylvania. One or more of them occurs in every county of the state, but only the white pine and the pitch pine have a wide distribution. The other four native pines have a rather restricted range.

In the winter months, there is something cheerful and lively in the appearance of the pines in spite of the cold and the snow. They may readily be distinguished by their leaves which are needle-like, occur in clusters of 2, 3, or 5, and persist throughout the winter. The latter characteristic places them among the evergreen trees.

The 34 different pines which are native to North America are classified into two groups, namely, Soft Pines and Hard Pines. Of the pines native to Pennsylvania the white pine alone belongs to the Soft Pine group, the other five species belonging to the Hard Pines.

In order that the pines of Pennsylvania may be recognized by every boy and girl, two simple keys have been prepared, the one based on leaf characteristics and the other on cone features.

LEAF KEY OF PENNSYLVANIA PINES*

1. Leaves slender, 5 in a cluster ..... White Pine
1. Leaves usually stiff, 2 or 3 in a cluster 2

2. Leaves 3 in a cluster ..... Pitch Pine
2. Leaves 2 in a cluster 3

3. Leaves 5 to 6 inches long ..... Red Pine
3. Leaves 4 inches or less in length 4

4. Leaves stiff and very sharp-pointed ..... Table Mountain Pine
4. Leaves slender to slightly stiff, dull-pointed 5

5. Leaves twisted, stout, 1½—3½ inches long ..... Jersey or Scrub Pine
5. Leaves straight, rather slender, about 4 inches long (sometimes 3 or 4 in a cluster) ..... Short-leaf Pine

CONE KEY OF PENNSYLVANIA PINES

1. Cones 5 to 10 inches long ..... White Pine
1. Cones less than 4 inches long 2

2. Cone scales not armed with prickles or spines ..... Red Pine
2. Cone scales armed with prickles or spines 3

3. Cone scales armed with prickles 4
3. Cone scales armed with stout spines ..... Table Mountain Pine

4. Cones narrowly and sharply conical when closed ..... Jersey or Scrub Pine
4. Cones broadly and bluntly conical when closed 5

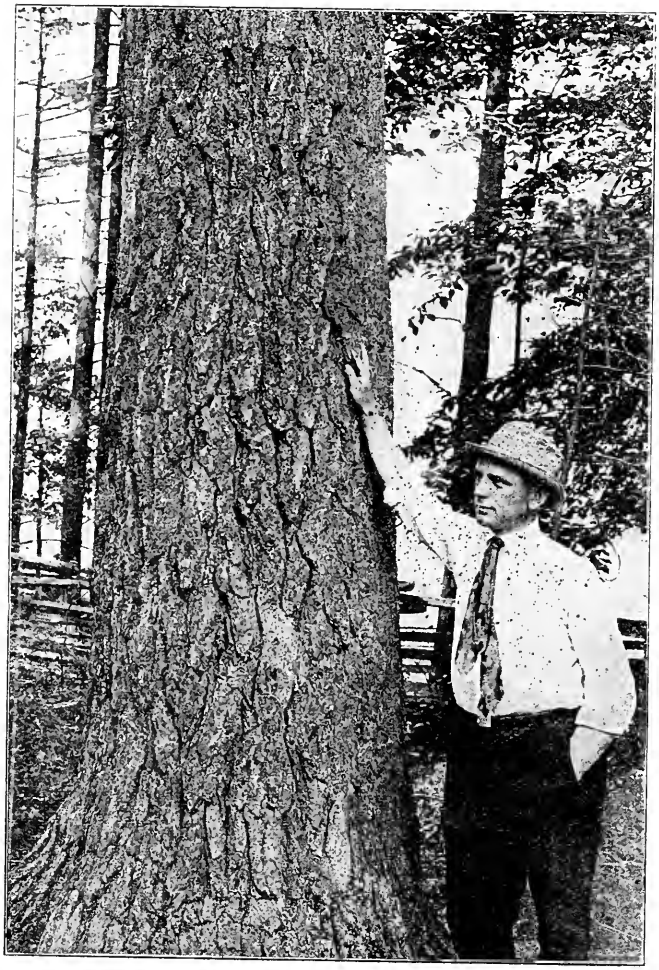
5. Cone scales thickened at apex and armed with short, rigid and recurved prickles ..... Pitch Pine
5. Cone scales slightly enlarged at apex and armed with weak prickles which may fall off early ..... Short-leaf Pine

WHITE PINE

The discovery of the white pine, which is the prince of all the forest trees of eastern North America, coincides with the landing of the Pilgrims on the bleak coast of New England. It was one of the few green things which greeted them, and it truly made a lasting

*One of the best methods of identifying trees is by the use of a key. The accompanying keys are simple in their make-up and may be used with little effort. They consist of alternative characteristics of trees made up in pairs and stated in two paragraphs preceded by the same number. Hence, if the characteristics of the tree to be identified do not fit the first paragraph, then they will correspond to those given in the second paragraph, or else the tree in question does not belong to the group considered in the key.

The two companion paragraphs of alternative characteristics are followed either by the name of a tree or by a number. If the name of a tree follows then it is the tree in question; if a number follows then it directs you to two companion paragraphs further on in the key preceded by that number. For example, if you find a pine tree in Pennsylvania with three needles in a cluster you may identify it by the use of the leaf key in the following way: Read the two statements of characteristics preceded by the number "1." The characteristics do not fit the first paragraph but will come under the second paragraph which is followed by "2." This directs you to the two paragraphs preceded by 2; of these the characteristics fit the first and not the second paragraph. Therefore, the tree in question is Pitch Pine, which name follows the first paragraph preceded by the number "2."



OUR NATIVE WHITE PINE MAY BE RECOGNIZED BY ITS DEEPLY-FURROWED BARK.

A CLUSTER OF POLLEN-BEARING BLOSSOMS OF THE WHITE PINE GROUPED BETWEEN THE NEW AND THE OLD NEEDLE CLUSTERS.

Photo by J. S. Illick.

PINE TREES MAY BE RECOGNIZED BY THEIR FORM

The white pine (left) and the short-leaf pine (right) are of the same age and grew up in the same environment.

and favorable impression upon them and those who came after them. There is no tree in the civilized part of the World which surpasses it in beauty, stateliness, individuality and usefulness.

Many years passed before the entire range of the white pine became known. As the pioneers pushed forward they found that this valuable timber tree had limits. In some localities it was abundant, in other places it was rare, and as they passed beyond the Allegheny Mountains it ceased to be a part of the forest. Now we know that it is found only in the eastern part of North America, extending northward as far as Newfoundland and the northern shore of the Gulf of the St. Lawrence, westward to Manitoba and Minnesota, and southward to northern Illinois and Pennsylvania and along the Alleghenies to Georgia.

In Pennsylvania the white pine originally formed dense stands, especially in the central and northern parts of the State. Many lumbermen claim that the best and most valuable stands of timber found in the whole United States east of Idaho occurred originally in northern Pennsylvania, and consisted of white pine and hemlock. White pine is still common in the mountainous part of the State, occurs sparingly in the western and southeastern parts, and rarely found in the agricultural valleys such as the Lancaster, Lebanon, Chester, Cumberland, Lower Lehigh, and Lower Delaware Valleys.

The white pine is one of our trees which may be recognized without much effort. It is the only evergreen tree native to eastern North America which has its soft, flexible, and bluish-green needles arranged in clusters of five. The lateral branches occur in whorls of 3 to 7 arranged in distinct horizontal layers. After the branches fall off they leave distinct circles of branch-scars along the stems. The cones are 5 to 10 inches long, attached to the twigs by a short stalk, rarely hang long upon the trees, and are covered with thin, flat and unarmed scales.

The wood is soft, straight-grained, and works easily. It weighs about 25 pounds per cubic foot, and was formerly used for a wider range of purposes than any other American wood. It is adapted for practically all purposes except where strength, hardness, flexibility, and durability in contact with the soil are required.

Sawmills began the manufacture of white pine lumber in 1623, and in 1635 a cargo was shipped to England from Massachusetts. Authentic records show that the first house built in America was constructed of white pine. In fact, the wood of this tree held such a prominent place in the lumber industry of America until about 1890 that the history of its exploitation was essentially the history of the whole lumber industry.

The white pine is the most important forest tree in eastern North

America, and probably in the World. It was introduced into England by Lord Weymouth and shortly afterwards into continental Europe, where it has been propagated so extensively that it is no longer regarded as a foreigner but as a naturalized member of their forests.

The white pine promises to become more abundant again, for it is being planted extensively and the remaining natural growth is now given better protection from forest fires and other destructive agents. Since 1902 over 25 million small white pine trees have been planted in Pennsylvania, and during the planting season of 1918 alone over 4 million seedlings and transplants were set out in the Keystone state. They are raised from seed produced in cones on mature trees. At the base of each cone scale two seeds with long brown paper-like wings are produced. The seeds are small in size and brown in color. It takes from 25,000 to 35,000 seeds to make a pound of clean seed. A pound of white pine seed is sufficient to sow a forest tree nursery bed of 100 square feet, and if all goes well, such a bed will produce 10,000 to 15,000 two-year old seedlings.

Many of these baby trees were set out by school boys, school girls and by Boy Scout organizations. Tree planting by boys and girls should be encouraged. It is a pleasant pastime and a useful practice. Their growth will visualize the building-up process in nature and be an excellent counter-part to the tearing-down operations which were impressed so vividly upon all of us during the recent world war.

PITCH PINE

Pitch pine possesses more common names than any other pine native to Pennsylvania. It has at least a dozen of them. Some of them are pitch pine, jack pine, hard pine, yellow pine, torch pine, nigger pine, black pine, scrub pine, long-leaved pine, rich pine, and fat pine. The scientific name of pitch pine is **Pinus rigida.**

Most of the common names refer to some distinctive feature of the tree or its wood. The name black pine and nigger pine refer to the dark bark frequently found upon large trunks. The name torch pine was given to it because it supplied the early settlers with pine knots used as torches about the primitive cabins and for traveling at night. The name yellow pine refers to old and mature trees that have replaced their typical blackish bark with yellowish bark. The names rich pine and fat pine are used locally. The backwoodsmen of Pennsylvania used these names because many of the old trees are rich or fat with resin. The name long-leaved pine is quite appropriate when one considers only the pines of the northeast, for some pitch pine trees develop needles much longer than any of our other native pines. It is not unusual to find trees with needles six or more inches in length.

The pitch pine, next to the white pine, is the easiest of the pines native to Pennsylvania to recognize, for it has positive distinguishing characteristics. Its needles are from three to five inches long and occur in bundles of three. The other hard pines of Pennsylvania have their needles in bundles of two and they vary greatly in length and texture from those of the pitch pine.

The bark of the pitch pine is ragged in appearance and breaks up into irregular plates separated by rather conspicuous furrows. Early in the life of a pitch pine tree the bark becomes quite thick, and after the sapling stage is reached the trees are fire-resistant. This thick bark accounts for the fact that the pitch pine is the most fire-resistant evergreen tree of the East. Forest fires will kill small seedlings, but as soon as the trees reach the sapling stage they develop a heavy bark. Severe forest fires have burned over extensive forest areas, and it appeared as if every living thing had been killed, but upon examining the area a year after the fire, one is often amazed to find that many of the medium-sized and larger pitch pine trees have withstood the extreme heat and are still growing.

Pitch pine does not present a neat appearance, but it is a rather picturesque tree. Its crown is irregular in outline and the trunk is often covered with gnarled branches, and occasionally with dense mats of leaves. It is the only Pennsylvania pine that produces these dense mats of leaves along the main stem, which occasionally envelop the trunk completely.

The cones of pitch pine are from two to two and one-half inches long. They are spherical to ovate in outline when open, persist for many years, and sometimes occur in dense clusters. A few years ago the writer found a cluster of nineteen cones on a small branch upon a young tree in Franklin County, Pennsylvania. Trees loaded down with thousands of cones are common. They may become a burden to the tree, and sometimes prove fatal, for during heavy snow storms the cones make an excellent place upon which the snow accumulates, and it is not unusual for it to collect in such large quantities that the branches break off and sometimes the entire crown is crushed completely.

The pitch pine is found from New Brunswick to Lake Ontario on the north, and south to Virginia, and along the mountains to Georgia, Kentucky, and Tennessee. It is probably the most widely distributed pine in Pennsylvania. It was originally less common than the white pine, but since the great lumbering days, during which the white pine was cut out, the pitch pine has been on the rise. It is found in every county in the State, but is commonest in the mountainous regions where it is associated with the rock oak and chestnut.

There are some excellent stands of pitch pine in Pennsylvania, and it is quite probable that within this State are found some of the best

stands in the entire range of the tree. The pitch pine trees of Mont Alto, in Franklin County, Snow Shoe, in Center County, and selected stands in Pike and Clearfield Counties are hard to surpass. From a commercial point of view, the pitch pine is not so important a tree as the white pine, but it is gaining favor for new and better uses are continuously being found for its wood. In the early days, when white pine was plentiful, no one cared to handle the inferior pitch pine wood, but conditions have changed and now it is looked upon with favor for many uses. It has won a place in our markets and in time it will move forward to a better position. It seems fair to assume that the wood of this tree will improve in quality when the trees are raised under good forest conditions.

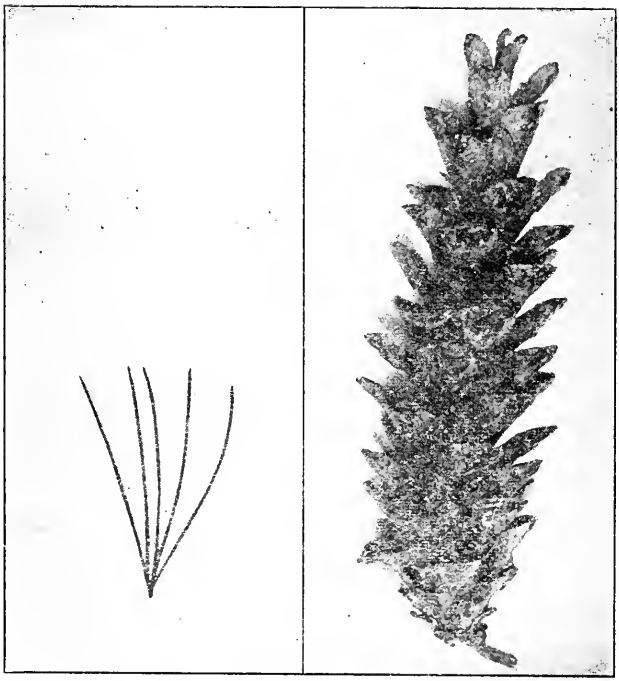
Pitch pine gives us a good example of a tree that should not be condenmed before studying its forest habits and growth peculiarities. Until a few years ago this tree was regarded as a slow grower, and because of this belief was called jack pine. A special study was made of its growth, and it was found that it grew more rapidly than was apparent, for instead of laying on all the growth of the season at one time it often places it in two or more installments. This installment method of growth was responsible for the false notion that it grew slowly.

The wide natural distribution of pitch pine in Pennsylvania,—its fire resistance,—and the fact that it is well adapted to our mountain soil,—recommend it as an important forest tree of Pennsylvania. While it appears to be an ordinary tree, yet it has so many good points that its importance and value will increase as the practice of forestry becomes more firmly established.

RED PINE

The red pine is a valuable timber tree. It has a number of common names. Probably the one used most frequently is Norway pine, a name wholly out of place because it is neither a native of Norway nor does it bear any resemblance to the pine trees of Norway. It is reported that the name Norway pine was given to this tree by a Spanish sea captain who thought this tree resembled pine trees he had seen in Norway. This supposed resemblance is responsible for the inappropriate name of Norway pine which has persisted until to-day and will no doubt continue for a long time, in spite of the fact that it is meaningless and misleading. Another common name is red pine. This is an appropriate name for the bark of the tree is reddish in color and the heartwood is usually pale red. The scientific name of red pine is **Pinus resinosa**, and means resin pine. This name is also inappropriate for its wood contains little resin in comparison with that of other pines.

The red pine is a native of the Northwoods. It extends as far south as central Pennsylvania and the Lake States. It reaches a



THE WHITE PINE HAS A DISTINCTIVE CONE AND ITS NEEDLES OCCUR IN CLUSTERS OF FIVE.

THE OLDEST WHITE PINE PLANTATION ON THE STATE FORESTS OF PENNSYLVANIA. THE TREES HAVE BEEN NUMBERED AND A RECORD OF THE GROWTH OF EACH TREE IS KEPT.

RED PINE HAS A DISTINCTIVE FORM. THE NEEDLES ARE CLUSTERED OR TUFTED AT THE ENDS OF THE BRANCHES.

PROBABLY THE LARGEST SPECIMEN OF TABLE MOUNTAIN PINE IN THE WORLD. IT IS 73 FEET HIGH, 23 INCHES IN DIAMETER AT BREAST-HIGH, AND FROM BRANCHES FOR A DISTANCE OF 40 FEET FROM THE GROUND. IT GREW AMONG HARDWOOD TREES ON A HILLSIDE NEAR MONT ALTO, FRANKLIN COUNTY, PA.

height of 70 or 80 feet and a diameter of 3 feet. In some parts of its natural range it attains an even greater size, and, as a rule, it is mixed with other trees. The optimum growth of this tree is in the northern part of the Lake States and in the southern province of Canada. Recently a new outpost of red pine was found on a farm woodlot near Selinsgrove, in Snyder County, Pennsylvania. This new station is 75 miles south of the most southern station of red pine that was ever reported.

Probably the most distinctive features of the red pine are its needles and cones. The needles are slender, flexible, from 4 to 6 inches long, and occur in clusters of two. They are surrounded at the base by a thin membranous covering or paper-like wrapper. The needles are grouped together in tufts at the ends of the branches. This characteristic is very helpful in recognizing the tree from a distance. The cones are about 2 inches long. They occur at the end of the season's growth and their scales are not armed with any spines or prickles. It is the only pine native to Pennsylvania whose cone-scales are unarmed. In addition to the leaf and cone characteristics, which should enable anyone to identify it at all seasons of the year, its general form and appearance and its distinctive bark will also help to identify it. It is unquestionably one of the most attractive conifers of the northeast and is being planted extensively for ornamental purposes.

The red pine is one of the most important timber trees of Pennsylvania, and as time goes on its real merits will become better known. It is not so abundant now in Pennsylvania as it was originally, for practically all the big trees have been cut out, and only a limited number of young trees have followed after the old veterans. The hope of having red pine in Pennsylvania in the future lies not in the natural growth that is coming on, but in the trees that are being planted. During the past ten years more than 1,000,000 red pine seedlings and transplants were planted on the State Forests of Pennsylvania and about 700,000 more were supplied by the Department of Forestry to private planters throughout the State. This does not include all the red pine trees planted within the State, for additional trees were purchased from nurseries and planted on private forest land. It seems fair to estimate that at least 2,000,000 red pine trees have already been planted in Pennsylvania and most of them are growing rapidly.

This valuable and promising forest tree should be carefully protected and its range extended by planting seedlings and transplants on the large areas of devastated mountain land in Pennsylvania. It has few enemies, grows rapidly, and if planted and protected will produce large quantities of high grade wood which is now urgently needed by our industries and homes.

SHORT-LEAF PINE

The short-leaf pine has more than a dozen common names. Some of them are appropriate, while others are misleading, and may embarrass one who attempts to identify it. The scientific name of the short-leaf pine is **Pinus echinata.** Of its fifteen common names none will ever replace short-leaf pine, for the leaves of this tree are truly short in comparison with those of the longleaf pine and other pines with which it is associated. Its distinctive leaves are from two to four inches long and usually occur in pairs, but occasionally three appear in a cluster, and sometimes four may be found in a group.

The cones of the short-leaf pine are rather distinctive. They are brown in color, from one and one-half to two and one-half inches long, nearly as wide as long when open, and attached to the branches by a short stalk. Each cone-scale has an enlarged end, which is armed with a weak prickle. Early in autumn the cones open to discharge the small triangular seeds which are produced in large numbers and scattered widely about the trees. Heavy seed crops occur at rather short intervals, which justifies one in being hopeful that nature will continue to propagate this important forest tree. Even as far north as southern Pennsylvania a large number of seedling trees are found in openings about older trees.

One of the best distinguishing characteristics of the short-leaf pine is its clean, stately, and slightly tapering, trunk—the bark of which is marked off by deep furrows into irregular or rectangular plates covered with thin scales. Some of the old specimens have been appropriately called "armored knights of the forest," for the bark is so distinctive and the tree trunk so impressive that the tree cannot be confused with its associates.

Short-leaf pine is found over an area of more than 440,000 square miles, but is of commercial importance over about two-thirds of its natural range. Its natural range extends as far north as western Connecticut, but near Mont Alto, in Franklin County, Pennsylvania, is the most northern heavy stand of short-leaf pine in America. In this stand are many stately trees with trunks two and one-half feet in diameter at breast high, and clear of branches for sixty feet from the ground. These magnificient trees are covered with a distinctive armored bark fully as typical as any grown in the south.

The short-leaf pine is commonest in the South, where it makes its best growth at elevations of 400 to 1,500 feet above sea level. It is, however, found from sea level to an altitude of 3,000 feet in the southern Appalachians. The commercial range of short-leaf pine has contracted considerably since the settlement of our country. It once grew as far north as Albany, and from fifty to one hundred years ago it was lumbered in many places in Pennsylvania where it has

now ceased to exist or only a few scattered trees remain. The geographical range is now given as from New York to Florida, west to Missouri, Oklahoma, and northeastern Texas.

In Pennsylvania the short-leaf pine occurs only locally. There is only one heavy stand in the State and that is found near Mont Alto in Franklin County. A few trees are found locally throughout the southeastern part of the State, and scattered specimens have been found as far north as Lycoming County, where it is reported that the tree was formerly far more abundant than it is now. It may be said that the tree is practically extinct in Pennsylvania excepting in local places in the southern and southeastern part of the State. The hope of keeping this important timber tree as a member of the forests of Pennsylvania is in the fact that a considerable number of young trees are beginning to appear about the few old trees that still remain, and a considerable number are being planted for reforestation. In the fall of 1921, 140 pounds of seed were planted in the Mont Alto nursery operated by the Pennsylvania Department of Forestry. With 50,000 to 60,000 seeds to each pound, there should result from this seed sowing at least two million seedlings.

The short-leaf pine is a companionable tree. One may find small forest areas occupied by it exclusively, but in the most of its range it is associated with hardwoods or other evergreen trees. Among its companions are pitch pine, scrub pine, and occasionally loblloly pine. At high elevations the white pine and table mountain pine stand by its side. Many kinds of hardwoods, such as oak, hickory, sassafras, ash, and cherry, are also associated with it.

The wood of short-leaf pine is hard, strong, and yellowish to dark brown. It weighs about forty pounds to the cubic foot and is used extensively for a large number of purposes. It is in great demand by builders of freight cars, large quantities are used for general construction work, and box and crate makers employ large quantities.

Short-leaf pine has been an important timber tree for many years, and everything points that it will continue to hold a place in the forest structure of southern and southeastern Pennsylvania. It attains a size sufficiently large for forestry purposes, produces excellent wood, yields large quantities of resin, and is well adapted to the climate and soil conditions in the forest regions of southern Pennsylvania and the south Atlantic States.

Every boy and girl interested in outdoor life will do well to try to locate a specimen of short-leaf pine in the natural forests of Pennsylvania and then become its protector. If no specimen can be found in the woods, you can satisfy your desire to perpetuate this

wonderful tree of the southland by planting a number of young seedlings and then watch them grow year by year into stately forest trees.

SCRUB PINE

The scrub pine is unfortunate in its common names. The word "scrub" implies that the tree is undesirable as a forest tree and produces inferior wood. The wood is inferior to that of white pine and some of the other important pines, but this does not necessarily mean that it is not satisfactory for use in wood-using industries. Each year the wood of this tree is being used more extensively for pulp, shipping crates, and general construction work. A few years ago more than 20,000 board feet of lumber were cut from trees of this species in the woodlot of Colonel Henry W. Shoemaker near McElhattan, in Clinton County, Pennsylvania, and used in the construction of one of the most attractive and substantially constructed barns of northern Pennsylvania.

The scrub pine is also called Jersey pine, because it was at one time reported as abundant in parts of New Jersey, where pine forests covered extensive areas known as the "pine barrens." Recent studies, however, show that most of the trees in the pine barrens are pitch pine and not scrub pine. Another common name applied locally to this tree is "slate pine." This name is used widely in southern Pennsylvania where this tree frequently occurs on slaty or shale soil. The scientific name of scrub pine is **Pinus virginiana.**

Scrub pine has many striking distinguishing characteristics. Its needles occur in pairs. They are twisted, spread widely from each other, and are from two to three inches long. These short needles are responsible for the common names "short-leaved pine" and "shortshat pine." No other Pennsylvania pine has needles which are so short, so twisted, and spread so widely. If one takes a position under a scrub pine tree and looks up into its crown, the light seems to be uniformly screened by the evenly distributed short needles. This type of leaf distribution is entirely different from some other pines, particularly the red and pitch pines which have their needles clustered or tufted at the ends of the branches.

The branchlets also have a distinctive feature. They are smooth, purplish, tough, and usually wavy—not stiff and straight as those of the other pines. The bark of the trunk is smoother and redder in color than that of any other native pine. Upon the older trunk the bark peels off in thin scales, giving the trunk a ragged appearance. The cones are narrow and conical, rather sharp-pointed, and often persist for several years. They are helpful in recognizing this small and distinctive forest tree.

The occurrence of the scrub pine may also be helpful in recognizing it. It is neither a tree of the coastal plains nor of the high

mountains, but prefers the rolling uplands between these two extreme positions. It is found from southeastern New York and Pennsylvania south to Georgia and Alabama, and west to Indiana and Kentucky. In Pennsylvania it occurs locally throughout the southern part of the State, and extends as far north as Allegheny County in the western part, Clinton and Lycoming Counties in the central part, and Northampton County in the eastern part.

The scrub pine may be regarded as a pioneer tree, for it is one of the first of our forest trees to march out from the forest and reclaim abandoned fields. There are thousands of acres of farmland in southern and central Pennsylvania abandoned within the last thirty years and now being occupied rapidly by the scrub pine. This tree cannot be placed in the class with the forest giants or sylvan monarchs, but it reaches a height of eighty feet and a diameter of two feet. Usually mature trees are from thirty to forty feet high and have a diameter of eighteen inches. The largest specimen reported in Pennsylvania has a total height of 82 feet and a diameter of 28 inches at breast-high.

TABLE MOUNTAIN PINE

The table mountain pine is the least known of the pines of Pennsylvania. For a long time it was thought that this tree occurred only upon the high tablelands of the southern Allegheny Mountains; but in 1863 a few specimens were found in central Pennsylvania by the late Dr. J. T. Rothrock while tramping over the hills of his native State with his teacher, Dr. Asa Gray—the world-famed botanist of Harvard University. Now this tree is known to occur in many places within the State as far north as Clinton and Union Counties, and northeast to Berks and Schuylkill Counties. These are the most northern outposts that are now known in the tree's entire natural range.

Each year new places are found within the State where the table mountain pine is growing. These new reports may be appearing because the tree is found chiefly in remote and inaccessible situations, which have been little explored by naturalists. The boys and girls of Pennsylvania should get much pleasure by organizinz clubs to go out and find new stations of this rare tree. In order to be successful in this exploration work, it is necessary to go to the rough and rugged mountain tops and ragged cliffs, for it is in such situations that this tree is usually found.

The table mountain pine is also called poverty pine, because it grows and usually thrives on poor, rocky and shallow mountain soils. The scientific name of this pine is **Pinus pungens.** It is an aggresive tree and consequently becomes a good competitor with other trees upon poor soil and exposed situations upon which it sometimes occurs in pure stands. This mountain tree, however,

makes its most rapid growth and develops its best form when standing in mixtures with hardwood trees upon rather fertile soil. What is probably the largest table mountain pine tree ever recorded in the World grew upon a mountain side near Mont Alto, Franklin County, Pennsylvania. This specimen was seventy-three feet high, twenty-three inches in diameter at breast-high, and free from branches for a distance of forty feet from the ground.

While the table mountain pine is typical of our highland forests, it is also found locally at low elevations. A few years ago the writer found a considerable number of trees of this species growing upon an island in the Susquehanna River below McCall's Ferry in Pennsylvania at an elevation of only about two hundred feet above sea level. The roots of the trees are washed continuously by the flowing water—a habitat so different from that upon which they usually occur. Specimens of this tree were also found upon other nearby islands and on the adjoining river hills of York and Lancaster Counties.

Few trees are easier to identify than the table mountain pine. Its needles, which are present at all seasons of the year, occur in pairs. They are very stout, stiff, and extremely sharp-pointed. No other pine tree native to eastern North America has such sharp-pointed needles. The cones of this tree are equally distinctive. They are coarse in appearance and bear cone scales which are armed with stout spines. They are from three to four inches long and usually occur in clusters of three, five, seven, or even more. These distinctive cones often persist for many years and cannot be confused with those of any other cone-bearing tree of the eastern United States.

The preference of this tree for poor rocky soil, and exposed situations, may also help to identify it, for it is found only from Pennsylvania south along the mountains to North Carolina and northern Georgia. When grown in the open its lateral branches persist on the main stem down to the ground, but if grown in dense stands the trunk is free from branches for a considerable distance from the ground, and the wood of such forest-grown specimens is satisfactory for general use.

The table mountain pine cannot be classified as a commercial timber tree of great importance, but it should not be despised, for like all other trees it has some merits. As the practice of forestry becomes more intensive, this tree will be utilized in protection forests on steep mountain slopes where it will help prevent erosion and assist in building up better forest conditions, and while it is doing this it will produce wood that can be used for a large number of ordinary purposes.

BUTTONWOOD OR SYCAMORE

Our native buttonwood tree belongs to the plane tree family. Only three different kinds of buttonwood trees are native to the United States. All of them attain tree size and belong to a group known by the technical name **Platanus**, which means "broad" and refers to the width of the leaves. The leaf-blades are not so broad as those of some tropical trees, but they are among the broadest found in temperate regions.

Probably no person with a practical knowledge of trees ever confuses the buttonwood with any other native forest tree. Notwithstanding the individuality of the tree, it has a good many common names. It is generally known as buttonwood in most of the New England and Middle Atlantic States, but it is also frequently called sycamore. In several of the eastern States, and occasionally in the Mississippi Valley, it is called buttonball, and locally in eastern Pennsylvania and in Delaware the name water beech is given to it. Ever since the closely-related oriental plane tree has been introduced on an extensive scale for ornamental planting, our native buttonwood tree is sometimes spoken of as the plane tree. The scientific name of our native buttonwood is **Platanus occidentalis.**

Our native buttonwood is found from Maine to Ontario and Nebraska, and south to the Gulf States, and west to Texas. It prefers moist, fertile soil but will grow in dry places. In Pennsylvania it is common along the streams and in other wet places in the eastern, southern, central, and western part of the State, but it is rare to absent on dry situations and in the high mountains.

The buttonwood stands out among our forest trees in that it casts its bark as well as its leaves. All trees do this to a greater or less extent, for it is a necessity of life that the bark yield to the pressure of the growing stem from within. Bark shedding is not hidden in the case of the shagbark hickory, silver maple, and ironwood, but the buttonwood is even more open in exhibiting its ability along this line than any other forest tree.

The most striking distinguishing characteristic of our native buttonwood is its thin, smooth, whitish, or pale green bark on young trunks resembling a crazy patchwork of white, green, yellow, and brown. In winter, the predominant color is white, while in summer there is a tendency towards green and brown. The leaves are simple, usually heart-shaped at the base, and wavy on the margin. They are from three to seven-lobed, and hairy or wooly on the lower surface. The most distinctive feature of the leaf is the enlarged or swollen base of the leaf-stalk. In late summer, just before the leaves begin to fall, one of the delights of the country boy is to ask his playmates to find buds on the buttonwood tree. A superficial examination of the twigs causes one to conclude that this tree bears

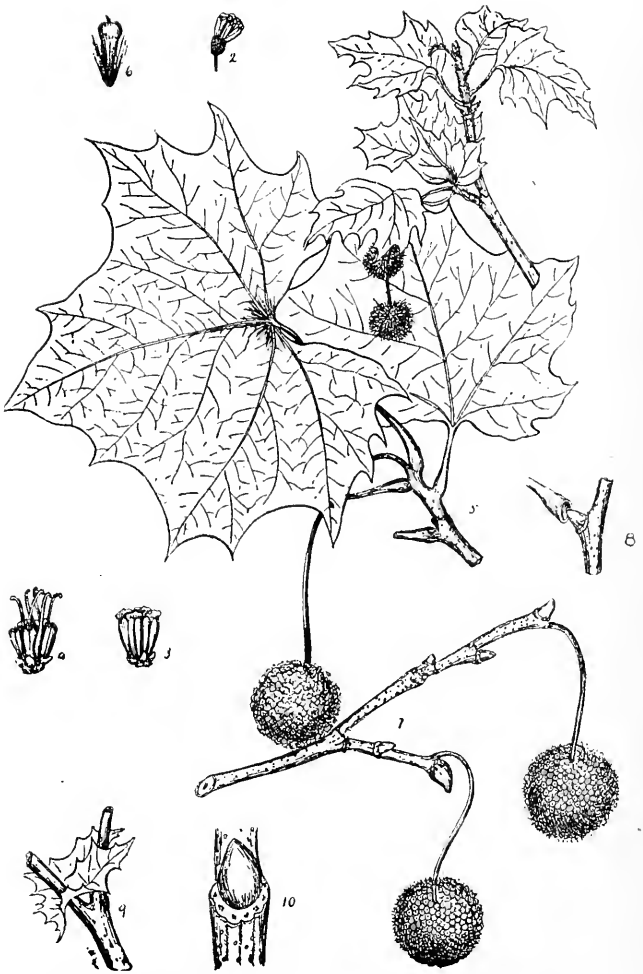
no buds, but a little bit of patience and a somewhat closer examination of the twigs will reveal that the buttonwood does have buds, and that they are hidden entirely under the enlarged stalks of the leaves. Nature seems to have provided a protective cover for the tender buds until they are fit to withstand the cold of late autumn and early winter. As soon as the buds are hardened up, the leaves fall off and the buds are ready for winter exposure. Because of their unusual position, the buds of buttonwood trees are often described as **sub-petiolar**, which means "under the petiole or leaf-stalk." This unusual characteristic enables anyone to identify buttonwood trees very easily during autumn and the winter months.

Another striking characteristic of the buttonwood is its fruit, which consists of small balls suspended on slender stalks. The balls are about one inch in diameter, and composed of a large number of slender and densely-packed seeds. One ball contains thousands of seeds. These balls ripen in late autumn, and may remain attached to the branches far into the winter, and some even hang on the trees until spring.

In winter the smooth, reddish-brown, pointed buds are a sure means of identification. They are completely surrounded by a leaf-scar and covered with a single bud-scale. If one takes a good look at the buds and winter twigs of a buttonwood, it will be easy to recognize it at any time during the winter months, for they are such positive distinguishing characteristics that they cannot be confused with those of any other associated forest tree.

The occurrence of the buttonwood is also helpful to identify it, for one usually finds it along the banks of streams, borders of ponds, and other wet places. In winter one often sees long wavy lines of sycamore trees which mark stream courses. They stand out conspicuously among other associated trees because of their white bark and distinctive crown forms.

The wood of the buttonwood is uniformly pale brown, somewhat tinged with red. It is a clean looking wood, and has an attractive appearance when manufactured, which accounts for the fact that it is extensively used in the manufacture of novelties and kitchen utensils. If one examines the numerous household articles offered for sale in a five and ten-cent store, it will be found that many of them are made of the buttonwood. Brush backs, mouse traps, kitchen utensils, and building blocks are among these articles. One of the most desirable characteristics of this wood is the fact that it neither stains or imparts odor or taste to substances that come into contact with it. The latest statistics show that more than 35,000,000 board feet of buttonwood are cut annually. About one half of this amount is used in the manufacture of boxes and crates. It has



THE BUTTONWOOD OR SYCAMORE IS READILY RECOGNIZED BY ITS DISTINCTIVE LEAVES, PECULIAR BALL-LIKE FRUIT, UNIQUE BUDS AND UNUSUAL LEAF APPENDAGES.

THE GIANT DAUPHIN SYCAMORE.

It is over 25 feet in circumference at the base and stands as a memorial to John Goodway, the last of the friendly Indians of Central Pensylvania.

THE BARK OF THE SYCAMORE IS DISTINCTIVE

It is a patch work of white, green, brown, and yellow

long been the favorite wood for boxes for plug tobacco, which stains easily and acquires an unpleasant taste and odor from most other woods.

Our native buttonwood has many good points, but unfortunately it has a number of serious enemies. Among them is a blight which attacks the leaves shortly after they have started to develop in spring. When the leaves are about one-third grown, little brown to black dots begin to appear upon them. These dots enlarge rapidly, and sometimes within a few days the leaves are completely browned up and shriveled, and fall to the ground. The leaves appear to be injured by frost, but the real cause of the damage is the blight, for which no practical remedy has yet been found.

The buttonwood grows at its best throughout the Mississippi Valley, and it also reaches a large size along the main rivers and in the fertile valleys of Pennsylvania. There is a buttonwood tree standing near Linglestown, Dauphin County, Pennsylvania, known as the "Dauphin Sycamore." It has a circumference of more than twenty-five feet at the base, a branch spread of over one hundred feet, and is in a healthy condition. Local historians tell us that the tree stands as a memorial to John Goodway, the last of the friendly Indians that lived in central Pennsylvania. It is said that he is buried about one hundred yards north of this magnificient tree, which remains as a memorial to his otherwise unmarked grave.

Among the historic trees of Pennsylvania is a buttonwood growing near Chadd's Ford in Delaware County. It stands close by the house used by General Lafayette as his headquarters before the battle of Brandywine, September 11, 1777. This tree is about seven feet in diameter, well proportioned, and remains as a worthy memorial to the great general. Another large buttonwood stands in a field on the old Rothermel farm in Maiden Creek Township, Berks County, Pa. It is the biggest tree in Berks County, Pennsylvania. This tree is over thirty-seven feet in circumference near the ground, one hundred and three feet high, and has a spread of branches of over one hundred feet.

The buttonwood is the giant of all American hardwoods. A few years ago a large specimen was found near Worthington, Indiana. It measured forty-two feet and three inches in circumference at five feet above the ground, and is one hundred feet tall. It is not unlike other large sycamore trees in that it branches near the ground. Its east branch is twenty-seven feet and three inches in circumference, and its west branch twenty-three feet and two inches in circumference.

We are just beginning to know the real merits of our native buttonwood. It seems fair to predict that before long its wood will play a more important role in the lumber industry of America than

it has in the past, and with a better understanding of its quality and fuller information about its growth peculiarities, this tree will begin to take a worthy place among our forest trees.

In addition to our native buttonwood or sycamore, another member of the family—native to southern Europe and western Asia—has been introduced extensively into Pennsylvania. It usually goes by the name "oriental plane tree." It has many good points and is being planted rather extensively for ornamental purposes. In the city of Philadelphia there are many specimens of it and most of them appear to be growing well. It grows rapidly, is hardy, possesses a beautiful crown, gives ample shade, has an attractive bark, and is troubled by only a few insects and fungi. It stands in the front rank among our shade trees, and in spite of its foreign origin has established itself firmly among our ornamental trees.

SASSAFRAS

Sassafras is the only tree of its kind in the United States. There is only one other kind of sassafras tree in the World. It is a native of China, and like our native sassafras belongs to the Laurel family. Our native sassafas is found from Massachusetts to Iowa and Kansas, and south to Florida and Texas. In Pennsylvania one rarely finds it in the high mountains, but it is a common lowland tree in the eastern, southern, and western parts of the State. One frequently finds it along fence rows and in abandoned fields where it sometimes forms extensive and dense thickets.

The sassafras was one of the first American trees that became widely known in Europe. The Indians told the early settlers about its medicinal bark and other properties, and the white man immediately attempted to commercialize its bark and other products. It is reported that sassafras roots comprised a part of the first cargo ever exported from Massachusetts. At present its medicinal properties are not prized so highly as in the early days, but its roots are still used in the preparation of "Sassafras tea" and in the manufacture of flavors for medicines and candy. It is a common practice among the mountaineers of southern Pennsylvania to grub out the roots, put them up in small bundles, and carry them to nearby market places where they are sold for a nickel or dime a bundle. Sassafras root collectors prefer to dig them up in abandoned fields and along fence rows where young trees come up in large numbers, often forming dense thickets.

The early inhabitants of Pennsylvania believed that the sassafras possessed miraculous healing properties. People then thought that sassafras could renew the youth of the human race. Even to-day this superstition still clings to this tree, and it is not entirely confined to ignorant people. Bedsteads made of sassafras are supposed to drive away nightly visitors that disturb peaceful slumbers. The

negroes of the South prefer to floor their cabins with sassafras, for they believe that it will keep away animals that may molest them. They believe too that sassafras poles are superior to all other woods for chicken roosts. They are confident that the poles will stop all kinds of men and animals that may attempt to lift the chickens from their roosts.

The distinctive aromatic taste of the bark, roots, and wood, and the accompanying pleasant odor of the sassafras, are the best and most reliable means of identification. If one breaks off a brittle twig of green-barked sassafras, a pleasant aromatic odor is given out immediately, and upon chewing it the flavor of the mucilaginous inner bark is found to be very delicious.

Three distinctive forms of leaves are often present on the same branch. Sometimes an even larger number of leaf forms may be found. The leaves are all simple in form and alternate in their arrangement. The oval entire-margined form is commonest. In the mitten form the leaf has one thumb-like projection which may be either on the right or on the left side. Sometimes the leaves are prominently three-lobed, and occasionally five-lobed specimens may be found.

The fruit is a dark berry which is borne on bright red and club-like fleshy stems and arranged in rather open clusters. It furnishes excellent food for birds but unfortunately does not persist until winter when the birds are often in great need of something to eat.

Sassafras is not an important forest tree in Pennsylvania. It does not occur in every part of the State, for one rarely sees sassafras trees in the cold and mountainous parts of northern Pennsylvania. Near the northern limit of its range it is generally small, but farther south it becomes a large tree frequently 40 to 50 feet high and 1 to 3 feet in diameter. Occasionally a tree is found that is 100 feet high and 3 to 4 feet in diameter.

The largest sassafras tree that has ever been found in Pennsylvania stood in a cemetery at Horsham in Montgomery County. A group of four large sassafras trees are growing along a state road about one-quarter of a mile north of Wawa Station in Delaware County. One of them stands outside of the roadside fence and the other three within the fence. These four trees measure 10 feet 8 inches, 11 feet 8 inches, 10 feet 7 inches, and 10 feet 4 inches in circumference at three feet above the ground. Another large and historic sassafras tree stands near Second and Emerald Streets in Harrisburg. It is a real landmark for the tree is 209 years old. It is 56 feet high and 13 feet in circumference at the base. It was about 15 years old when John Harris—the founder of Harrisburg—was born. This tree is no longer thrifty, for most of its crown has disappeared.

The wood of sassafras resembles that of the Chestnut and it is often substituted for it on the market. In many localities sassafras wood is sought for the purpose of smoking meats, the claim being made that it imparts a very desirable taste. The wood is durable in contact with the soil and consequently used rather extensively for fence posts, rails, and occasionally it is manufactured into furniture. Sassafras wood is used more extensively than our records show for it is usually sold under other names. It is not unusual to find it listed under Ash, and when it is used in the manufacture of coffins it is listed as Chestnut.

There exists no good reason for believing that the sassafras will become extinct, for it produces seeds abundantly and the birds carry them into fence corners and scatter them in large numbers over pastures where the young trees often form dense thickets.

RED MULBERRY

The red mulberry, when first discovered in Virginia, inflamed the early colonists with great hopes, for they thought they had found a new source of food for the silkworm. Unfortunately, their great commercial dreams never came true, for the red mulberry was no satisfactory substitute for the white mulberry, the leaves of which were the chief source of food for the silkworms in Europe and Asia.

The red mulberry is the only mulberry native to the eastern United States. It is found from Massachusetts west to Kansas and south to Texas and Florida. Its best growth occurs in the lower Ohio Valley and the foothills of the southern Appalachian Mountains. Nowhere in Pennsylvania is the native mulberry abundant, but it is found locally in the fertile valleys and along the foothills in the eastern and southern parts of the State. It also occurs locally in the central part, but is generally absent in the cold and mountainous regions.

Being the only representative of its kind, it is not difficult to distinguish the red mulberry from our other forest trees. In summer the large, roundish, sharp-tipped leaves with deeply sunken veins on the upper surface are distinctive. Some of the leaves are lobed and resemble an ordinary mitten in outline. The best distinguishing characteristic of the leaves is the milky secretion given out by the leaf-stalks if pressure is placed upon them. Only a few other trees give milk, and they bear no resemblance to the red mulberry.

The flowers appear in spring when the leaves are about one-fourth developed. There are two kinds, namely, pollen-bearing and seed-producing. Both kinds occur in short tassels (catkins). The pollen-bearing and seed-producing occur separately, but may be found on the same or different trees. The seed-producing blossoms develop

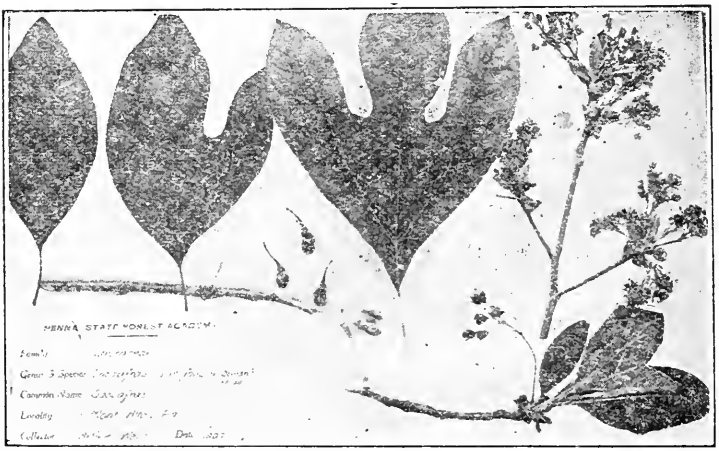


Photo by J. S. Illick.

SASSAFRAS.

Mature and immature (three forms) leaves, flowers, fruit, and a winter twig.

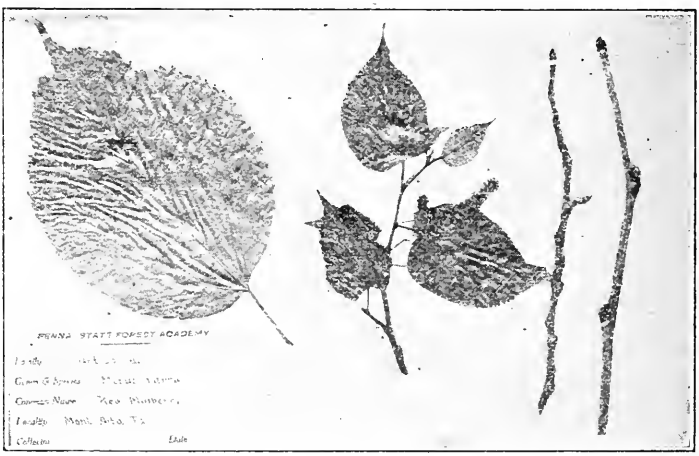
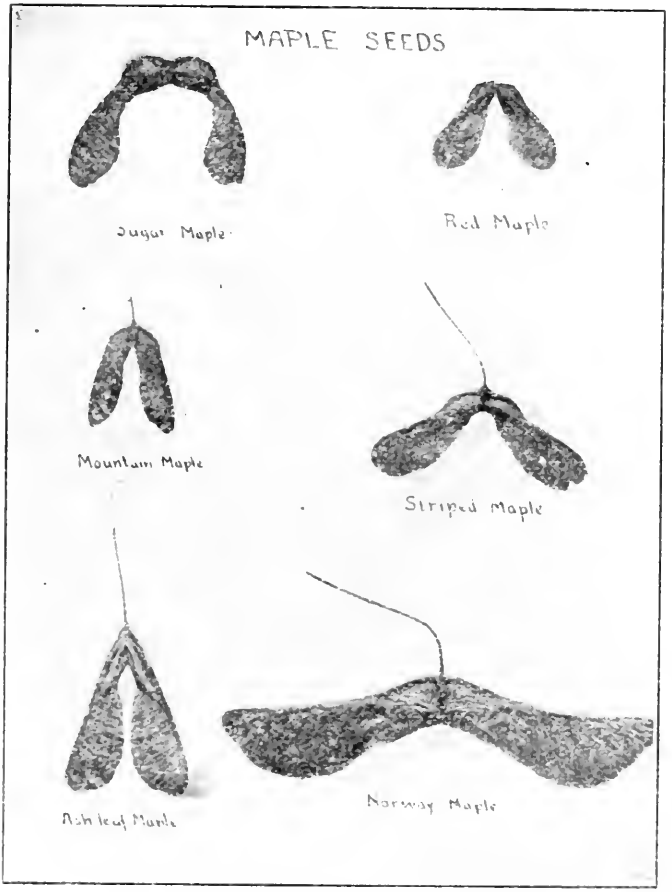


Photo by J. S. Illick.

RED MULBERRY.

Mature and immature leaves, flowers, and winter twigs.



FRUIT OF OUR COMMON MAPLES

into purplish aggregate fruit which is the distinctive product of the tree. No other native tree produces a fruit which bears any resemblance to that of the mulberries.

In winter the red mulberry is not especially attractive, but it can readily be distinguished if its twigs are examined closely. They are very smooth, clean, and light-greenish brown. A milky juice comes out of them if they are cut. They bear oval and hollow leaf-scars which contain a large number of dot-like bundle-scars arranged in a closed ellipse, or they are sometimes distributed irregularly over the surface of the leaf-scars. No other tree has leaf-scars with such a hollow, bowl-like surface.

Two foreign mulberries have been planted rather extensively in Pennsylvania. They are the white mulberry and the paper mulberry. In some localities they have escaped cultivation and occasionally they are mistaken for the native red mulberry. The white mulberry is a native of China and the paper mulberry is a native of Japan. The former is common in some localities of Pennsylvania and it is not unusual to find it in woodlots and waste places, for in many places it has escaped from cultivation. The paper mulberry is much rarer in Pennsylvania and belongs to an entirely different group of trees. It belongs to a group of trees known by the scientific name **Broussonetia,** while the true mulberries bear the technical name **Morus.** Specimens of paper mulberry may be found upon waste areas near towns and cities, and occasionally it appears as an ornamental tree.

The red mulberry cannot be classified as an important timber tree, but it has many qualities which have been utilized by man. The fruit is valued for fattening hogs and poultry. It is also intimately associated with harvest time, for many a weary harvester has found shelter under its crown, and been refreshed by its fruit. Mulberry trees are common objects along fence rows bordering fields of golden grain. The mulberry waterkeg holds a prominent place in many localities, for it is claimed by the laborers who work in the field that no receptacle is so well adapted to carry and keep water as a keg made of mulberry wood. The wood is very durable and used chiefly by boatbuilders, coopers, and implement makers.

THE MAPLES

The maples are among the best known trees in the Northern Hemisphere. They are abundant in China and Japan, common in Europe, and widely distributed in North America. There are seventy different kinds of maples known in the world. Thirty-five of them are native to China and Japan, and thirteen occur in North America. Six of the latter are native to Pennsylvania.

Japan is the ancestral home of the maples. It is said that one can find in the Island Empire of the Orient traces of the first maple tree that ever grew on the surface of the earth. For centuries the people of Japan have been breeding maples in order to develop varieties with unusual and unique characteristics. The development of pigmy maples is a real art in Japan. For cenuries they have been fashioning these miniature trees, and now there is an established custom in Japan to hold annual Maple Shows, which are in many ways similar to the Rose Shows of America.

While the Japanese maples excel in variety and uniqueness, the American maples are unrivaled in the World in size, beauty, and commercial value. No other group of our native trees show such a wide variation in form and structure as do the maples. They range in size from large commercial timber trees to small trees and shrubs. The leaves of many of them are simple but a few have compound leaves. The twigs of some are slender, while those of others are stout; their color may be green, gray, brown, or red. Maple flowers may occur in small lateral clusters, in long drooping tassels, or in erect spikes. On some maples the flowers appear before the leaves, while on others they appear with or after the leaves. The fruit of the maple is very distinctive. It consists of a pair of winged seeds which is called a maple-key. Each kind of maple tree bears its own distinctive key-like fruit, which can readily be distinguished from that of all other maples.

The maples occur on a wide range of habitats. The ash-leaved maple grows at its best along the streams and along the border of ponds and lakes. The sugar maple prefers well drained, rich soil. The striped maple is satisfied in shaded and moist places, while the mountain maple thrives on dry, rocky hillsides and mountain tops.

Of the thirteen maples native to the United States, nine occur east of the Rocky Mountains, and six of these are native to Pennsylvania. The six maples native to Pennsylvania are:

	COMMON NAMES	SCIENTIFIC NAMES
1.	Sugar Maple; Hard Maple.	Acer saccharum.
2.	Silver Maple; Water Maple.	Acer saccharinum.
3.	Red Maple; Soft Maple.	Acer rubrum.
4.	Ash-leaved Maple; Box Elder	Acer negundo.
5.	Striped Maple; Moosewood.	Acer pennsylvanicum.
6.	Mountain Maple; Spotted Maple	Acer spicatum.

The maples as a group have so many different characteristics and such striking features that they can be distinguished with little effort from all other groups of trees at every season of the year. They are readily distinguished from other trees, but some of them are so closely related to each other that it is difficult to tell them apart. The following table gives the distinguishing characteristics of the four big maples of Pennsylvania:

HOW TO RECOGNIZE THE FOUR BIG MAPLES OF PENNSYLVANIA.

	SUGAR MAPLE	SILVER MAPLE	RED MAPLE	ASH-LEAVED MAPLE
LEAVES.	Simple usually 5-lobed, coarsely toothed, pale green on lower surface.	Simple, 5-lobed, silvery white on lower surface, leaf-clefts deep and round-based.	Simple, 3 to 5-lobed, whitish on lower surface; leaf-clefts shallow and sharp-pointed at base.	Compound, with 3 to 5 leaflets.
FLOWERS.	Appear with the leaves. Occur in drooping clusters.	Appear before the leaves. Occur in dense clusters along twigs.	Appear before the leaves. Occur in dense clusters along twigs.	Appear with the leaves. Occur in drooping clusters and spikes.
FRUIT.	Matures in autumn. Medium-sized maple key borne on long stalks and clustered.	Matures in early summer. Large maple key with rather divergent wings.	Matures in early summer. Small maple key, arranged in short lateral clusters.	Matures in late summer. Medium sized maple key with converging wings; arranged in long drooping clusters. May remain on trees over winter.
BUDS.	Brown, sharp-pointed, with 8 to 16 exposed scales. Occur solitary along twigs.	Red, blunt-pointed, cluster d along twigs.	Red, blunt-pointed, clustered along twigs.	Short-stalked, blunt-pointed, white wooly; clustered along twigs, only a few bud-scales visible.
BARK.	Grayish brown on twigs, gray to black on main stem, not scaly.	Greenish to reddish brown on twigs, dark gray and scaly on main stem.	Reddish with white dots on twigs, grayish and somewhat scaly on main stems.	Smooth and purplish green on twigs, grayish brown and furrowed on main stem.

THE SUGAR MAPLE

The sugar maple is the best known hardwood tree native to eastern North America. It is found from Newfoundland to Manitoba and south to Florida and Texas. It occurs in every state east of the Mississippi, but is not abundant in the South. It reaches its best development from New England across New York and northern Pennsylvania to Michigan. All who have visited the northwoods know the beauty, stateliness, and healthy appearance of this prince among our forest trees.

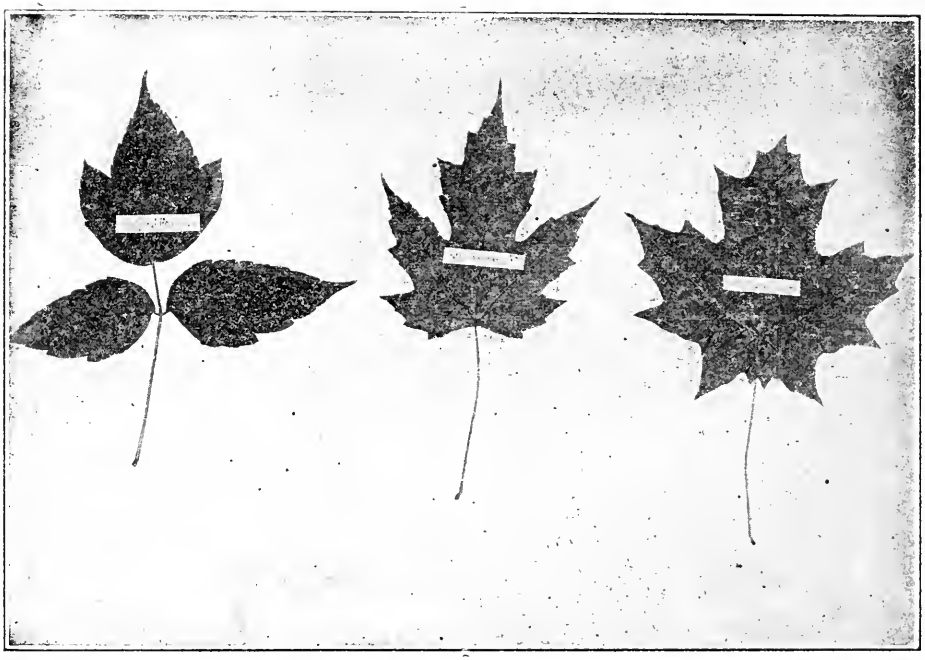
The sugar maple is fortunate in having a number of appropriate common names. The name sugar maple is appropriate for it produces annually large quantities of sweet sap. It is also called hard maple because its wood is hard in comparison with that of the other maples which are often grouped under the name Soft Maple. The name rock maple is also appropriate, because its wood is extremely hard.

The wood of Sugar Maple has a wide range of uses, and the farmer boy regards this tree as a real friend, for when tapped it produces large quantities of sap from which the delicious maple sugar and maple syrup are manufactured. This tree has yielded as high as 550,000 pounds of maple sugar and 275,000 gallons of maple syrup in a single season in Pennsylvania. This shows that the value of the tree lies not only in the fine wood that it produces but also in other products that it yields.

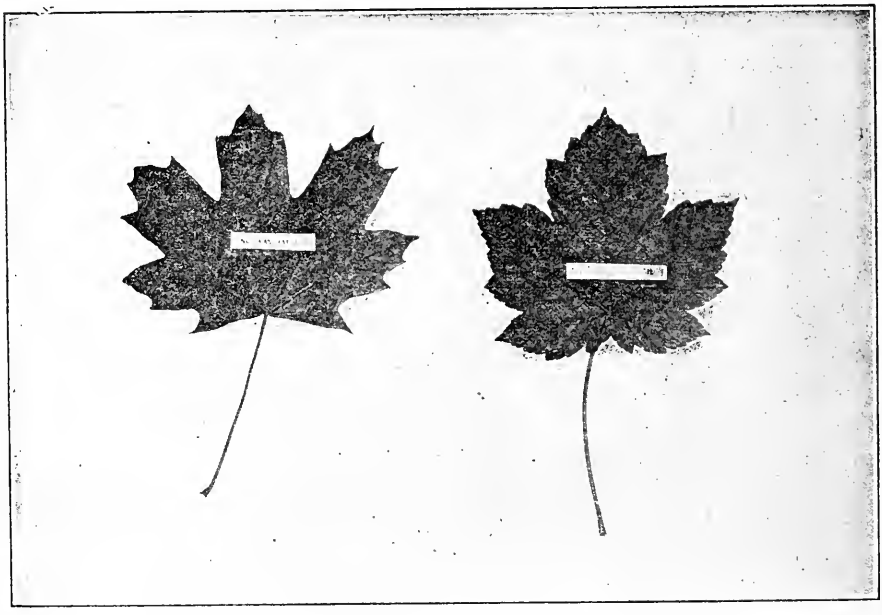
At all seasons of the year the sugar maple may be distinguished with little difficulty. The grayish to black bark on old trunks, roughened by shallow fissures, is always distinctive. The slender, brown twigs, marked with pale dots, are also positive means of identification. In summer its large, simple, and compound leaves, with coarsely-toothed lobes and delicate texture enable one to recognize it.

There is no more positive distinguishing characteristic of the sugar maple than its buds. They are brown in color, sharp-pointed, conical, and covered with 8 to 16 exposed scales. They are clustered at the ends of the twigs, and occur solitary and opposite each other along the side of the twigs. If seen but once, the twigs bearing these distinctive buds cannot be confused with those of any other native forest tree.

The fruit of the sugar maple does not mature until about September. It often persists far into winter, while that of the red maple and silver maple ripens in early summer. The seeds of the sugar maple germinate soon after falling to the ground, and the seedlings form a dense mat on the forest floor. The writer has counted as many as 50,000 small sugar maple seedlings on a single acre of



LEAVES OF THREE COMMON PENNSYLVANIA MAPLES.
Left to right: Ash-leaved maple, silver maple, sugar maple.



LEARN TO KNOW THE INTRODUCED MAPLES.
At the left is the leaf of theNorway maple, and at the right that of the sycamore maple.

A DISTINCTIVE WINTER TWIG OF SUGAR MAPLE.

SUGAR MAPLE. FLOWERS, FRUIT, AND LEAVES

FLOWERS, LEAVES, AND FRUIT OF SILVER MAPLE

forest land in northern Pennsylvania, and similar plots are common in New York, Michigan, and Wisconsin.

The wood of the sugar maple is well known and widely used. It touches our hands and satisfies our wants almost daily. We use it more frequently and in a greater number of ways than any other wood. It may be classified as an all-purpose wood, for it is used in the manufacture of at least 500 distinct articles of commerce. It makes the best wooden floor and is one of our chief furniture woods. Large quantities are used in the manufacture of broom handles, refrigerators, kitchen cabinets, toothpicks, children's toys, musical instruments, and agricultural implements. It is difficult to think of any common household article that is not, at one time or another, made from sugar maple wood.

The sugar maple tree is quite common in Pennsylvania. In fact, it is the commonest tree in the State. It is not equally common in all parts of the State, but is more abundant in the northern, northwestern, and northeastern parts of the State than in the southern and southeastern parts. It is a member of the northern hardwood forest, and becomes less common as one enters the southern hardwood forests which extend northward into Pennsylvania along the river valleys.

The sugar maple is one of our most dependable forest trees. It grows rather slowly, but it keeps growing steadily for a long while, and in time it attains a large size. One of the largest sugar maple trees known in Pennsylvania stands near Eagles Mere. It is a forest giant and towers high above all other surrounding trees. It is almost 4 feet in diameter, at breast high, and does not bear a single lateral branch for 60 feet from the ground. An occasional sugar maple reaches a height of 120 feet with a diameter of 5 feet, but specimens of this size are rare.

The sugar maple deserves to be protected and propagated for forestry and ornamental purposes. It produces wood which ranks among the best, yields delicious syrup and sugar, lives long, furnishes excellent shade, and possesses some of the cleanest and most beautiful features of any American forest tree. As a memorial tree the sugar maple has few equals, and as an avenue or roadside tree it ranks among the best.

RED MAPLE

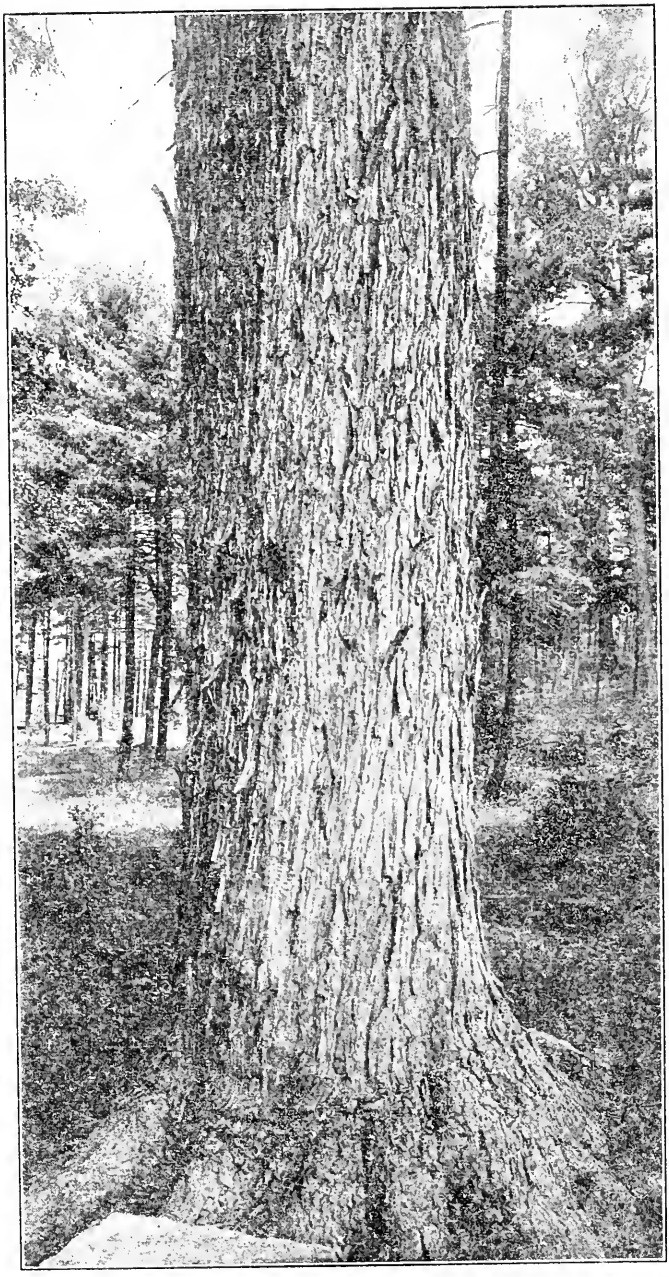
The red maple never forgets its common or scientific name. At all seasons of the year some part of this tree is distinctly red. Early in spring red clusters of flowers appear all along the twigs, and red are the wings of its key-like fruit that matures during May and June. In summer there is a tinge of red on the leaf-stalks and veins of the leaves, and in autumn red maple may be found that stands out

among its neighbors as a flaming torch. The scientific name of the red maple is **Acer rubrum.** This name is appropriate for the word "rubrum" means red. Other common names of this tree are soft maple, which refers to the softness of its wood, and swamp maple, a name given to this tree because it makes its best growth in swampy places.

The range of the red maple covers more than 1,000,000 square miles, and touches every state east of the Mississippi River, and west of it, occurs from South Dakota to Texas. It is found locally throughout Pennsylvania. It is common to abundant in the regions traveresed by rivers and their main tributary streams. It prefers rather wet to swampy ground, but also makes a satisfactory growth on hillsides and often attains large dimensions in fertile farm woodlots in the agricultural valleys of the State. Big red maple trees sometimes exceed 100 feet in height and are more than four feet in diameter. Their average size is about seventy feet in height and two feet in diameter. The largest forest-grown red maple tree recorded in Pennsylvania stands in the woodlot of Jacob Meyers, near Coburn in Centre County. It is almost 4 feet in diameter and free from lateral branches for 50 feet from the ground.

The red maple can be recognized in summer by its simple, rather small, 3 to 5-lobed leaves, which are pale green to whitish on the lower surface, and darker green upon the upper surface. The clefts between the lobes of the leaves are shallow and sharp-pointed at the base. The latter characteristic distinguishes it from the closely-related silver maple which has clefts that are rounded at the base. In winter the red maple is bare of foliage, and displays its distinctive dark-gray bark; also its clean, smooth, grayish branches, and its bright red twigs, loaded rather heavily with clusters of winter buds and dotted with numerous white breathing pores known as lenticels. In winter it is rather difficult to distinguish the red maple from the silver maple. The latter, however, usually lacks the lustrous red twigs of the former and if one breaks the twigs of the silver maple they give off a rather pungent odor not found in the red maple.

The wood of red maple is about three-fourths as strong as that of the sugar maple, and is considerably lighter in weight. In color the wood is light brown, sometimes slightly tinged with red. The sapwood is rather thick, and lighter in color than the heartwood. Lumbermen know the difference between the red maple and our other native maples, but they do not consider it worth while to pile and sell the wood separately. It sometimes comes upon the market as hard maple, and at other times as soft maple, but never is it sold under the name of red maple. The wood is manufactured into flooring, veneer material, and interior finish. Large quantities of it are



A BIG RED MAPLE.

Many big maples are found in Pennsylvania. This one is 4 feet in diameter and clear of branches for 40 feet from the ground.

BARK OF SILVER MAPLE.

Scaly bark and shallow furrows are the main distinguishing characteristics of the silver maple bark.

also being used for pulpwood. It is also sawed into veneer which is made up into berry boxes and peach and potato baskets. Its sap is also collected and manufactured into sugar and syrup, but in smaller quantities than that of the sugar maple. In the days of the pioneer, ink and dyes were made from its bark, which also yielded small quantities of tannin.

There is a place in our forests for the red maple. It is tolerant of shade, grows rather rapidly, and becomes a big forest tree. It deserves a place in the understory of the forest, and, when an opportunity presents itself, it will grow up into the upperstory of the forest and produce valuable lumber.

If there is one maple that excels all other maples in beautiful coloration in the forest it must be the red maple. It also thrives when planted along streets and in parks, but it is rather short-lived and requires plenty of moisture.

SILVER MAPLE

The silver maple is one of the best known of the Pennsylvania maples, for it has a wide natural distribution and has been planted extensively as a shade and ornamental tree. It is a favorite with those who desire to secure shade with as little delay as possible, for it grows rapidly and is adapted to a great variety of soils, but does not flourish upon dry situations. It likes moist to wet places such as are found along river banks and borders of ponds.

The silver maple has a number of common names. Lumbermen usually call it soft maple because the wood is much softer than that of the sugar or hard maple. It is also known as white maple and silver-leaved maple, because the lower leaf surfaces are white or silvery white in color. Other common names are river maple, swamp maple, and water maple. These names refer to the habitat upon which this tree is usually found.

In summer the silver maple may be easily recognized by the silvery white under-surface of the leaves. The bases of the deep leaf-clefts of the silver maple are rounded, while those of the red maple are sharp-angled. The silver maple blossoms very early in spring before the leaves make their appearance. In fact, it is among the earliest of our native trees to bloom. In most localities the flowers appear before those of the red maple. They usually occur in compact, small clusters along the twigs, for each lateral bud usually contains from three to five blossoms ranging in color from reddish to crimson and are favorites with the honey bees which swarm around them on the first warm days of spring. Its fruit matures early in summer and is larger than that of any other of our native eastern maples. The bark is somewhat furrowed and separates into long scales which are often loose at both ends and at-

tached at the middle. This is a helpful distinguishing characteristic at all seasons of the year. The bending down of the branches and the distinctive upward sweep of their small ends is also a helpful means of identification. In winter the silver maple can be distinguished from all other maples, excepting the red maple, by its numerous round, red, clustered buds; and from the red maple it may be distinguished by its bright chestnut-brown twigs which give forth a pungent odor if broken.

The silver maple occurs from New Brunswick and Ontario southward to Florida, and west to Oklahoma and the Dakotas. It is usually found along the banks of streams, borders of swamps, and other wet places. In Pennsylvania it is common along the banks of the principal rivers and their main tributaries. Along these streams it is commonest at the lower altitudes where it, together with the ash-leaved maple and the river birch, sometimes makes up 90 per cent of the trees along the river banks; but as one goes into the mountains and ascends to higher altitudes the tree becomes rarer and about the headwaters of the streams it is often entirely absent.

The silver maple may attain a large size upon favorable situations. It is not unusual to find a tree one hundred feet in height and from three to four feet in diameter. The wood is much softer than that of the sugar maple, but it is used for a wide range of purposes. It is especially prized in the manufacture of fruit baskets and berry boxes.

It is planted extensively for ornamental purposes, for it possesses attractive features. It is one of the first trees to bloom in spring, has an attractive clean bark, and produces beautiful leaves, and if grown in the open its outline and poise suggests an elm. A beautiful cut-leaf variety with a weeping habit has been developed and is being used rather extensively for formal planting. Before planting the silver maple for ornamental purposes, one should know that it is short-lived and its branches are so brittle that they are frequently broken off in winter by the wind and snow and ice pressure.

THE ASH-LEAVED MAPLE

The ash-leaved maple has ten or more common names. Among them are box elder, three-leaved maple, and water ash. There is no good reason why this tree should be called an elder or an ash, except that its leaves are compound. This characteristic is not sufficient reason for calling it a box elder or water ash, for it would be equally correct to call it a hickory or walnut, since these trees also bear compound leaves.

This tree is clearly a maple. Its fruit is a distinct maple-key and cannot be confused with the fruit of any other forest tree. Its compound leaves do not necessarily take it out of the maple group, for

the leaves of some of our native maples are deeply lobed, and it is not a long step to the compound leaf with three leaflets.

The natural range of the ash-leaved maple does not fall far short of 3,000,000 square miles, and is equaled by few other forest trees. It is found from New England across Canada to Alberta, and thence south to Florida, Texas, and Mexico. It thrives in hot and cold climates, and grows well at high and low altitudes and in regions of much and little rain. The fact that it is such an adaptive tree accounts for its wide use in the early days by tree planters in the prairie regions. It was planted more extensively than any other tree by the homesteaders in the Middle West. Its rapid growth afforded early protection against the scorching summer sun and the strong winter winds. It was also among the first street trees in many of the western towns. The people planted it because they knew it would grow, and they were not so sure about some of the other trees. Now better trees have been found and they are willing to replace the ash-leaved maple by more valuable and better species.

The ash-leaved maple is most abundant in the eastern and southern part of Pennsylvania. It is quite common and attains a large size along the streams in the southwestern part of the State, and is the prevailing tree along the Conococheague Creek in Franklin County and other streams and rivers in southern Pennsylvania. As one follows these streams into the mountains, the Ash-leaved Maple becomes rarer and it is usually entirely absent at higher elevations in the northern and central part of Pennsylvania.

The ash-leaved maple differs from all other maples in that it has compound leaves with from three to five leaflets. The other maples of the eastern United States have simple leaves. It also differs from the other maples found within its range by the fact that it usually produces its pollen-bearing and fruit-producing flowers on separate trees, while both pollen-bearing and fruit-producing flowers of the other native maples usually occur on the same tree. This striking difference was formerly regarded sufficient reason to place the tree in a distinct group all by itself, but now it is again classed with the other maples under the technical name **Acer.**

Perhaps the most attractive feature of the ash-leaved maple is the rich color of its twigs. They are gorgeously olive-green and usually covered with a white bloom, and stand out boldly against the skyline. Its stout twigs may, in part, be responsible for the name of water ash. The large, ovate, and downy buds are also distinctive. They occur opposite each other and are usually arranged in small clusters along the twig. The leaf-scars completely encircle the twigs, and their edges meet in such a way as to form a sharp angle. The twigs and the buds are so distinctive that this tree can readily

be recognized during the winter months from all associated forest trees.

The fruit of the ash-leaved maple resembles that of the other maples, but the maple-keys are arranged in drooping clusters and persist far into winter. It is not unusual to find the fruit clusters remaining upon the trees until spring. The seeds are scattered during four or five months of the year, and because of the large number that are produced the future of this tree is quite secure.

The bark on the older tree trunks is rather thick and distinctly furrowed, and it rarely breaks up into scales. The bark bears more resemblance to that of the ashes and basswoods than to other maples. This feature of the tree may be partly responsible for calling it water-ash.

The wood of ash-leaved maple is the lightest of the maples. It weighs less than 27 pounds to the cubic foot, and is manufactured into boxes, crates, flooring, woodenware, and locally into furniture. The tree reaches commercial size in at least thirty states, and in everyone of them it is cut and marketed. Recent tests show that wood pulp manufactured from it is satisfactory, and it is also used by distillation plants with the other maples, beech, and birch, and converted into charcoal and other products of distillation.

The ash-leaved maple deserves a place in our forests, and it may also be planted for ornamental purposes, but great care should be taken in selecting places upon which to plant it. It will grow well if set out in soil adapted to it, but one should remember that it prefers moist to wet soil. It will make its best growth if planted along the borders of streams or about ponds and lakes. If planted upon favorable situations it will grow fast and produce a dense and satisfactory shade. As a shade tree it has the advantages of rapid growth, dense foliage, and pleasing color. It is also comparatively free from the attack of fungi and insects. The chief objection to it as an ornamental tree is its habit of always shedding something. The blossoms litter the ground in spring, the seeds are dropped from early winter until springtime, and the leaves fall in and out of season.

TWO SMALL PENNSYLVANIA MAPLES

The two Tom Thumb maples of Pennsylvania are the mountain maple and the striped maple. Neither of these trees attain a size sufficiently large to classify them as timber trees, but both are so attractive and have such striking distinguishing characteristics that they deserve a place in our forests and in ornamental plantings. To those people who are fortunate enough to spend their summer vacations in the mountainous parts of the Northwoods, the mountain maple and the striped maple are familiar sights. Over large regions these shrubs or small trees are found along highways, by the margin of trout brooks, and about ponds and lakes. Both of them

ERECT FLOWER, SPIKES, AND LEAVES OF THE MOUNTAIN MAPLE.

FLOWERS, LEAVES, FRUIT OF THE STRIPED MAPLE.

are satisfied to take their place in the under-story of the forest, while others of their kin reach up high and struggle for a place in the upper-story of the forest. The following table gives the striking distinguishing characteristics of these two beautiful small maples:

	MOUNTAIN MAPLE.	STRIPED MAPLE.
FORM AND SIZE.	Shrub or small tree, rarely over 15 feet high; often occurs in clumps.	Small tree, usually 15-30 feet high.
LEAVES.	Usually 3-lobed, coarsely toothed, 3-5 inches long, light hairy on lower surface.	Goose-foot-like, 5-6 inches long, 3-lobed at apex, finely toothed, prominently veined; rusty hairs on lower surface.
FLOWERS.	Occur in erect spikes, 3 to 4 inches long.	Occur in drooping tassels 3 to 4 inches long.
FRUIT.	Small maple key about ½ inch long, arranged in dense drooping clusters.	Small maple key about ¾ of an inch long, arranged in open drooping clusters.
BARK.	On twigs reddish brown to gray; on stem reddish brown dotted with gray blotches.	On twigs reddish; on stem reddish brown streaked with long white lines.
HABITAT.	Prefers rocky situations on mountain tops and hillsides.	Prefers moist situations in dense woods.

THE MOUNTAIN MAPLE

The mountain maple has an appropriate common name, for it is a mountain tree. One usually finds it on moist rocky hillsides and along the border of ravines and highways. It seldom reaches a height greater than 20 or 25 feet. In the Northwoods it is usually small, often occurs in clumps, and occasionally it forms dense thickets. In the South it becomes larger and it is not unusual to find specimens that stand alone. In western North Carolina one can find trees with a breast-high diameter up to 12 inches.

The mountain maple is native from Newfoundland to Manitoba, south to Michigan and Pennsylvania, and extends along the Alleghenies Mountains to Georgia. In Pennsylvania it is found locally in all parts of the State. It is rare in the eastern and western parts, and common in the mountains of central and northern Pennsylvania. The natives of Potter County call this tree "spotted maple" because of the gray dots that are spotted over the reddish brown bark.

The mountain maple can be distinguished by its simple 3 to 5-lobed and coarsely-toothed leaves. They are smaller, more evidently lobed, less conspicuously veined, and less hairy on the lower leaf surface than those of the striped maple. The new twigs of early summer are greenish and more or less downy, but after the leaves drop in autumn the small twigs have a rather distinct reddish brown to crimson color. If one examines the twigs closely there is seen upon them a whitish coating of fine hairs which enables one to distinguish the mountain maple from all other closely-related trees.

The flowers of the mountain maple do not appear until early summer—a short while after the leaves have reached full size. They are arranged in erect spikes at the end of the new growth. No other native maple has its white flowers arranged in such conspicuous erect spikes. The fruit matures slowly during the summer, ripens in autumn, and often remains upon the trees far into winter. During late summer and early fall the key-fruits often take on wonderful hues of red, and may furnish one of the most attractive features of the landscape. The individual fruit-keys are smaller than those of any other native maple and are clustered on slender drooping stalks.

The mountain maple is of practically no commercial importance as a timber tree, but it is valuable as a soil protector on rocky slopes, and very desirable for ornamental purposes. It seems strange that this tree is not more widely used in landscape gardening, for at all seasons of the year it possesses attractive features. It is very hardy, and apparently free from insect and fungous enemies. This tree has enough good points to justify a more extensive planting for ornamental purposes.

THE STRIPED MAPLE

The striped maple is one of the most distinctive members of the under-story of the forests of the Northwoods. Anyone who has wandered through the mountains of the North or the Alleghenies must have met this beautiful little tree. It is usually found beneath the big monarchs of the forest, and one cannot miss it for it is so beautiful and its white-streaked bark compels attention.

In summer the striped maple is easily recognized by the large goose-foot-like leaves which have a rather thin blade and are fashioned with a delicate network of veins. The upper surface of the leaves is dark green, while the lower surface is considerably lighter in color and clothed with short rusty brown to reddish hairs. The margins of the leaves are finely-toothed, and the leaf-blade is divided into three more or less conspicuous lobes. In spring and early summer, just when the leaves are about fully developed, the drooping clusters of beautiful yellow flowers dangle down from the twigs. The individual flowers are small, bell-shaped, and greenish to yellow in color. They cannot be confused with those of any other maple. The fruit is a typical small maple key with the wings united at a rather wide angle. It matures early in autumn, and there are about 15,000 seeds per pound.

The best way to distinguish the striped maple, also known as moosewood and whistlewood, is by its beautiful striped markings on the bark. The bark is generally some hue of green, or red, and streaked through it are conspicuous white lines. This characteristic is responsible for the name "streaked maple" which is used by the

inhabitants of Potter and adjoining counties in Pennsylvania. In winter the large evidently-stalked buds covered with two smooth bud-scales, the smooth reddish-brown twigs, and the brown pith will enable anyone to distinguish this beautiful and distinctive small forest tree.

The striped maple has practically no commercial value as a forest tree, but its attractive features recommend it highly for ornamental purposes and as a member of the under-story of our natural forests it is worthy of our best care and protection.

TWO FOREIGN MAPLES

Two European maples have been planted widely for shade and ornamental purposes in Pennsylvania. They are the norway maple and the sycamore maple. It is difficult to find a town or city within the State in which one of these trees has not been planted, and in many places fifty or more per cent of all the street trees are Norway and sycamore maple. These two well-known and widely distributed foreign trees have a number of features in common, but they can be distinguished from each other at all seasons of the year by the characteristics set forth in the following table.

	NORWAY MAPLE.	SYCAMORE MAPLE
BARK,	Black, furrowed, not scaly.	Brown, scaly, not furrowed
LEAVES,	Flexible, large, coarsely-toothed, almost entire on margin, smooth on lower surface, resembles Sugar Maple; leaf-stalks contain milky sap.	Firm, 3 to 5-lobed, sharply-toothed on margin, slightly hairy on lower surface; leaf stalks do not contain milky sap.
FLOWERS,	Arranged in yellowish green clusters.	Arranged in erect spikes about 3 inches long.
FRUIT,	Large maple-key with widely divergent wings.	Small maple-key with almost parallel wings.
BUDS,	Large and red.	Large and green

NORWAY MAPLE

The norway maple comes to us from Europe, where it is found from Norway to Switzerland. In its native home it reaches a height of 100 feet and a diameter of 3 feet. It is occasionally used for forest purposes, but its main value is as a street, shade, and ornamental tree.

The norway maple can readily be distinguished in summer by its large leaves, which resemble those of the sugar maple, but they are deeper green in color and firmer in texture. Its large-toothed and almost entire-margined leaves are readily distinguished from the 3 to 5-lobed and smaller leaves of the sycamore maple. A charac-

istic by which the norway maple can always be identified is the presence of milky sap in the leaf-stalks, for no other maple of Pennsylvania has this rare characteristic. The milky sap flows freely if the leaf-stalks are twisted or pressed. Another feature by which this tree may be recognized in spring and early summer is its yellowish green flowers. They are produced in large numbers and arranged in dense clusters along the twigs. They come out of the same buds as do the leaves, and blossom when the leaves are from one-third to one-half developed.

In winter this tree can be recognized by its large red, blunt-pointed and glossy buds. They are usually bright red but may be more or less olive green at the base especially in autumn before they are mature. The lateral buds stand close to the twigs while those of the sycamore maple project outward. The fruit of the norway maple does not ripen fully until late in summer or early autumn. They are larger and more beautiful and distinctive in form than those of any of our native maples. These key-fruits have wide divergent wings, which enables one to distinguish this tree from all other maples. Many of the key-fruits remain upon the tree after the leaves have fallen. Sometimes they hang upon the trees all winter, and because of their large size and distinctive form are helpful in recognizing this tree during winter months.

The norway maple is one of the most attractive of our ornamental trees and is unquestionably the best maple that we have for street use. It is especially adapted for city planting because it is tolerant of unfavorable city conditions. It is also hardy, rather free from the attacks of insects and fungi, and retains its leaves longer in fall than our native maples.

SYCAMORE MAPLE

The sycamore maple, like the norway maple, is a European tree. It takes its name from the fact that its leaves are supposed to resemble those of a sycamore. In central Europe it attains a height of 120 feet, and develops a large spreading crown. The trunk is sometimes furrowed, and the bark flakes off in thin scales. In its habit of growth it follows the norway maple, except that its top is not so compact, and it is also less tolerant of soil conditions and consequently is not planted so extensively as its European brother.

The sycamore maple is readily distinguished by its firm 3 to 5-lobed leaves with sharp-toothed margins. The clefts in the leaves are sharp-angled, and the lower leaf-surface is usually somewhat hairy. In winter the large blunt-pointed green buds, the bud-scales of which usually have a black margin, are a sure means of identification. Its leaf-scars do not quite encircle the twigs, while those of

the norway maple reach completely around the twigs. The little dots on the twigs known as lenticels are more numerous on the sycamore maple than on the norway maple. The lateral buds of the sycamore maple stand out from the twigs, while those of the norway maple hug the twigs closely. The fruit-keys of the sycamore maple are smaller and thin wings less divergent than those of the norway maple. These characteristics enable one to distinguish the two widely introduced European maples at all seasons of the year.

The sycamore maple is not so hardy as the norway maple, nor is there anything distinctive about the tree to make it preferable to our native hard maple. It is often attacked by borers and does not thrive on all kinds of soil. There exists no good reason for planting this foreign maple on an extensive scale in Pennsylvania.

WHERE TO STUDY TREES

The place to study our trees is not so important as the time to begin getting acquainted with them. The thing to do is to start studying them to-day, and not wait until to-morrow or next week. If you live in a city and it is not convenient or possible to go out in the woods, you may study the trees along the streets or in the parks. The small woodlots, fence rows, stream banks, and abandoned fields are much better places. But, the best place for a real study of our native trees is the remote wildwoods, that is, the extensive and natural forests on our mountain slopes, hilltops, and valleys.

In the woods of Pennsylvania there are more than 100 different kinds of native trees, and when one observes them in the remote mountain regions they look so natural and fresh. Associated with them are many other plants and a large number of animals. If you are really anxious to learn to know the trees and can possibly do so, take a hike to the wildwoods and there observe the wonders of nature and study the works and ways of the wild folks.

No woods within the State are better equipped for tree study than the State Forests. In 1897, the State of Pennsylvania, through its Department of Forestry, began buying land for forestry purposes. To date (January 1, 1922) 1,126,237 acres have been purchased at an average cost of $2.26 per acre. This large area is now being developed so that it will yield not only wood, but be of the greatest service to the inhabitants and visitors of the State.

In order to handle the state-owned land properly, the aggregate area has been divided into State Forests, each one of which is in charge of a technically trained Forester, who aims to manage the land in his care in the best interests of the public.

An increasing number of people are annually seeking the advantages and benefits of a few weeks of real out-of-door life on the State Forests. The Foresters will help you select a suitable camp

site, tell you about the streams, springs, roads, trails, and look-out towers, and even help teach the boys and girls about the trees, shrubs, herbs, and other plants and animals of the forest.

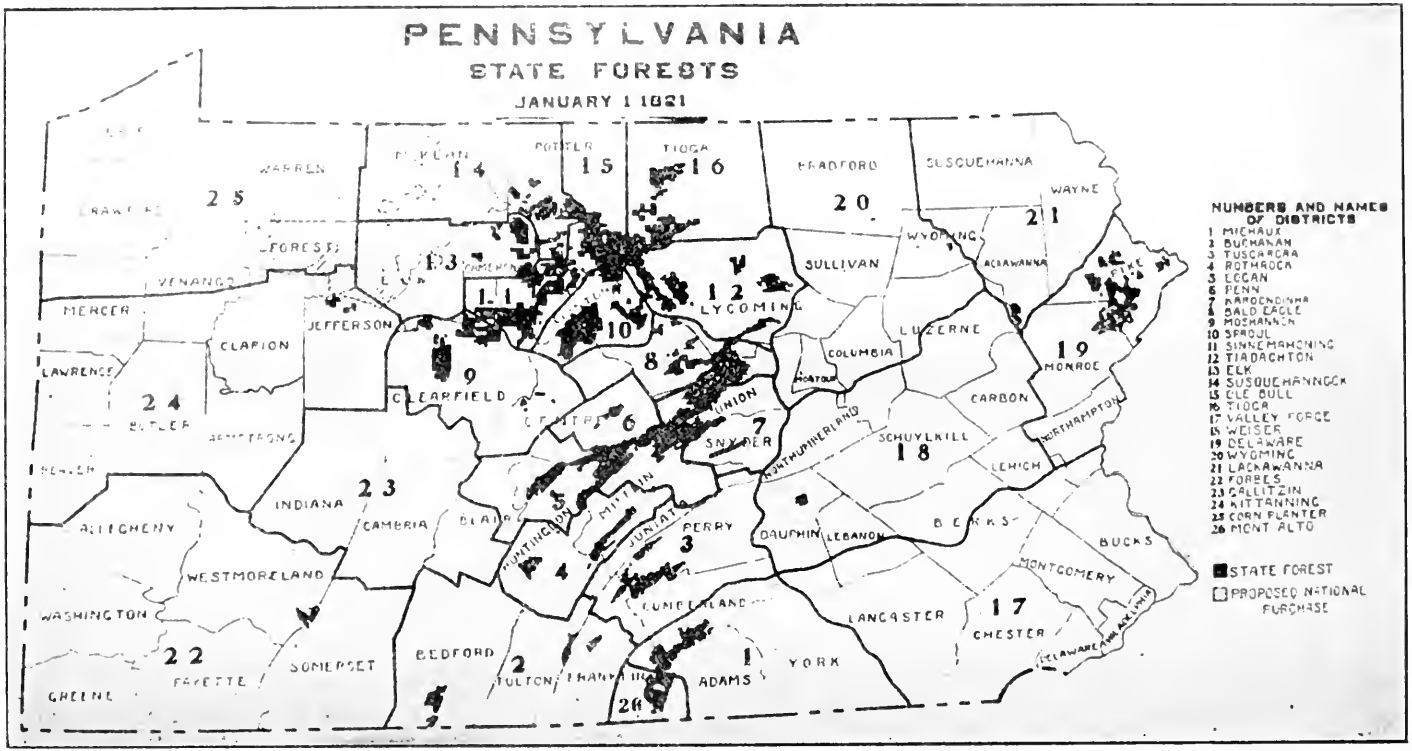
WHERE THE STATE FORESTS ARE LOCATED

Most of the State Forests of Pennsylvania are located in the mountainous part of the State. They are wide open for use and contain some of the best playgrounds and rest places. If you are planning a trip to the mountains, a week in the woods, or some other out-of-door doings, it may save you much money and eliminate a lot of worry if you look over the following table, which tells you where the forest land now (January 1, 1922) owned by the State of Pennsylvania is located:

	COUNTY	ACRES
1.	Adams,	20,887
2.	Bedford,	10,756
3.	Cameron,	83,055
4.	Centre,	79,388
5.	Clearfield,	64,875
6.	Clinton,	143,829
7.	Cumberland,	21,720
8.	Dauphin,	3,808
9.	Elk,	22,767
10.	Franklin,	34,677
11.	Fulton,	6,355
12.	Huntingdon,	62,249
13.	Jefferson,	5,681
14.	Juniata,	3,534
15.	Lackawanna,	5,275
16.	Lycoming,	104,306
17.	Mifflin,	50,383
18.	Monroe,	6,400
19.	Perry,	29,468
20.	Pike,	58,109
21.	Potter,	158,785
22.	Snyder,	19,087
23.	Somerset,	3,467
24.	Tioga,	66,941
25.	Union,	54,193
26.	Westmoreland,	5,065
27.	Wyoming,	1,177
	Total,	1,126,237

YOU ARE WELCOME ON THE STATE FOREST

The people of Pennsylvania own over one million acres of forest land which is being administered for them by the Department of Forestry. Every acre of this vast area, which comprises some of the



WHERE THE 1,126,237 ACRES OF STATE FORESTS ARE LOCATED.

most attractive camp site, finest fishing streams, and best hunting ground within the State, is open for public use.

You do not need a pass to go on the State Forests and to enjoy yourself. They are neither surrounded with high stone walls or barbed wire fences, nor with signboards bearing the words "No Trespassing", "Closed", or "No Admittance". Instead each forest is wide open for business and for play.

All that will be required of you is to obey a few simple rules which all good citizens of the State are always willing to do. There is no red tape to this proposition of public use of State Forest land. It is a whole-hearted plan which aims to be of the greatest service and utmost benefit to all the people of the State.

Remember that you are always welcome on the State Forests of Pennsylvania. The Foresters in charge of them will be delighted to show you over the woodland areas in their care. They will do more than merely greet you, for one of their duties is to help you locate a suitable camp site and tell you how to get a camping permit. They will explain to you the rules and regulations of the forest and direct you to fine fishing streams. They will also point out good roads, attractive trails, beautiful vistas, wonderful look-outs, and in addition tell you many interesting things about forestry.

FACTS ABOUT PENNSYLVANIA STATE FORESTS

The original forests covered practically every acre of ground in Pennsylvania. More than thirteen million acres are still classified as forest land, but about five million are barren and unproductive. This is the Pennsylvania Desert.

The Department of Forestry began purchasing forest land in 1898. The total area of forest land owned by the State (January 1, 1922) was 1,126,237 acres. The average price paid per acre was $2.26.

Forestry is a business enterprise. A concise financial statement pertaining to the State Forests follows:

Total purchase price	$2,546,407.71
Total amount expended for administration, development and improvement	5,182,262.68
Total investment and expenditures	7,728,670.39
Amount deposited in State school fund	241,793.64
Net expenditure	7,486,876.75
Estimated present value of forests	$12,255,439.51
Net expenditures	7,486,876.75
Net gain on investment	$4,768,562.76

The Department of Forestry has paid for road, school and county taxes $616,040.17 to the counties in which the State Forests are located.

There are 60 Foresters and 82 Forest Rangers in the employe of the Department of Forestry.

There are 2,628 local and special Forest Fire Wardens in the State who watch for and fight forest fires.

There are 422 State-owned buildings on the State Forests valued at $306,329.39.

Approximately 2,000 miles of forest boundaries have been surveyed, cleared, and marked.

More than 4,000 miles of roads, trails, and fire lines have been constructed and are being maintained.

During 1921, 400 temporary camping permits were issued to 5,000 persons.

More than 750 leases for permanent camp sites have been issued.

Seventy steel fire look-out towers have been erected by the Department of Forestry for the purpose of detecting forest fires, and four steel towers were erected by the Anthracite Forest Protective Association.

Three forest tree nurseries are maintained by the Department of Forestry, which are producing from five to eight million trees each year.

A total of 34,222,596 trees have been planted on State Forests. The plantations now cover 22,468 acres.

During the last twelve years private planters have received from the Department of Forestry 14,627,006 trees, which were set out in all parts of the State.

Within the State Forests are many of the best places to rest, finest fishing streams, best hunting grounds, and grandest views within the State.

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